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ROGER (L.). **Sur un chancre de l'Hévéa en Cochinchine et au Cambodge : le chancre coloré dû au Pythium complectens Braun.** [On a canker of *Hevea* in Cochin-China and Cambodia: the coloured canker due to *Pythium complectens* Braun.]—11 pp., 2 pl., Hanoi, Institut des Recherches agronomiques et forestières de l'Indochine, 1940. [Received April, 1947.]

This study on infection of *Hevea* rubber in Indo-China by *Pythium complectens* [*P. vexans*] is the full account of work already noticed from another source [*R.A.M.*, xx, p. 321].

MARTIN (W. J.). **Diseases of the Hevea Rubber tree in Mexico, 1943–1946.**—*Plant Dis. Reptr*, xxxi, 4, pp. 155–158, 1947. [Mimeographed.]

As the result of a survey carried out by the Rubber Plant Investigations Division of the United States Department of Agriculture, the following diseases were recorded in *Hevea* rubber plantations in the states of Veracruz, Tabasco, and Chiapas in southern Mexico.

South American leaf blight (*Dothidella* [*Melanopsammopsis*] *ulei*) [*R.A.M.*, xxiii, p. 80; xxvi, p. 416] was first observed near Teapa, Tabasco, in September, 1946 and later was found in most plantings. Bird's eye spot (*Helminthosporium heveae*) [ibid., xxv, p. 358] was prevalent on young nursery seedlings during the dry season.

Leaf spots were caused by *Phyllosticta* sp. [ibid., xviii, p. 579], which affected occasional nursery plants rather severely; *Glomerella cingulata* [ibid., vii, p. 186], apparent on nursery seedlings throughout the year but not causing much damage; *Periconia heveae* [ibid., xxv, p. 9], found in one instance generally throughout a small nursery, causing some damage; an undescribed leaf spot due to an *Alternaria* sp., which caused considerable defoliation on clone GA–1279 in budwood gardens at El Palmar, Veracruz, in 1946; a *Didymella* sp. on seedlings; and *Cephaleuros virescens* [ibid., iii, p. 478], common on old plants, and causing relatively little damage.

Pink disease (*Corticium salmonicolor*) [ibid., xxvi, p. 28] was quite prevalent during a rainy spell in a three-year-old seedling nursery at El Palmar in 1945. Die-back of young budded shoots (*Phytophthora* sp.) [ibid., xxi, pp. 42 and 323] affected a considerable number of young budded plants growing under very shaded conditions during a rainy period in September 1944. Sunscald [ibid., xxiii, p. 148] killed a number of nursery seedlings. Mouldy rot (*Ceratostomella fimbriata*) [ibid., xxv, p. 96] was the most destructive disease in old plantations at El Palmar. It caused great damage during the rainy seasons and was always present on some of the trees. The only promising control was obtained by using a fungicidal paste containing spergon. Of many other fungi isolated from diseased panels only a species of *Fusarium*, when tested, was found to be pathogenic, but only slightly so compared with *C. fimbriata*.

Root disease caused by *Helicobasidium* sp. [cf. ibid., xviii, p. 546] was destructive in isolated sections of seedling nurseries at El Palmar in 1943 and 1944. But the

average loss was less than 0·1 per cent. The tap roots of affected seedlings wilt and die during the dry season. The typical mycelial mat type of fruiting structure was formed at or just above the soil line during the latter part of the rainy season. As a result of white rot disease (*Polyporus* [*Fomes*] *lignosus*) [ibid., xxv, p. 358] about 2 per cent. of the plants in a two-acre experimental planting had to be removed by the end of the third year at El Palmar. The disease also occurred in nurseries and was prevalent in one planted in 1945.

VAN HELL (W. F.). **De natuurwetenschappelijke Instituten tijdens den bezettingstijd. Kort overzicht over het Algemeen Proefstation der A.V.R.O.S. gedurende den oorlog.** [The scientific institutes during the occupation period. A brief survey of the General Experiment Station of A.V.R.O.S. during the war.]—*Chron. Natur.*, ciii, 5, pp. 70–73, 1947.

Among the papers published by the A.V.R.O.S. General Experiment Station during the Japanese occupation of Sumatra was one by the author dealing with the root disease caused by *Rigidoporus microporus* [*Fomes lignosus*] in young rubber replantings (1½ years old). Three years' omission of any kind of attention to the trees resulted in 32 per cent. mortality, half-yearly treatments (without eradication of the old stumps) in 21·8 per cent., and clean-clearing of the entire area in 4·2 per cent. [*R.A.M.*, xix, p. 44].

Ricinus [*communis*], planted on a large scale by the occupying authorities, was found to be suffering from slime disease (*Bacterium* [*Xanthomonas*] *solanacearum*) [ibid., xiii, p. 659].

WALLACE (T.) & HEWITT (E. J.). **Studies in iron deficiency of crops. I. Problems of iron deficiency and the interrelationships of mineral elements in iron nutrition.**—*J. Pomol.*, xxii, 3–4, pp. 153–161, 1947.

Problems relating to iron deficiency in plants [cf. *R.A.M.*, xxv, pp. 98, 119, 124, and next abstract] are discussed with reference to its occurrence in the field and in pot cultures and to the interrelationships existing between iron and various mineral elements. Recent work on the subject is reviewed and correlated. The importance of this deficiency in field conditions lies in the difficulty of controlling it. Soil treatments with iron salts or sulphur, or 'grassing-down' seldom remedy the condition, and resort has to be made to spraying or injection [ibid., xxv, p. 120]. The latter can be applied only to trees, and while effective on apples, causes gumming in stone fruits. Sprays if used at effective rates may injure the trees, and in any case their effects are transient, the iron in the plant tissues being, in cases of iron deficiency, relatively immobile.

In iron-deficiency problems four groups of causal factors operate: (1) where the total supply of iron is insufficient; this probably occurs only in pot cultures, (2) lime-induced chlorosis on calcareous soils [ibid., xxv, p. 586], (3) iron deficiency resulting from other mineral deficiencies, or (4) from excesses or toxicities of other mineral elements.

While manganese has been clearly demonstrated to be antagonistic to iron in solution cultures, this does not seem to be an important factor in lime-induced chlorosis. On acid soils manganese may be toxic to many plants, but a number of the toxic effects appear to be distinct from iron deficiency. The importance of the manganese-iron ratio in inducing iron deficiency in acid soils needs further study.

The chief characteristic of leaves of plants affected by lime-induced chlorosis is their high potassium content and low calcium-potassium ratio. The evidence suggests that this results from the chlorosis. Iron deficiency may be brought about by potassium deficiency, but a distinction must be made between simple potassium deficiency, which may induce iron deficiency, and cases where deficiencies

of the two elements arise simultaneously but are causally unrelated. Phosphorus commonly induces iron deficiency in solution cultures and may do so in neutral and slightly alkaline soil conditions, though it seems less likely to be an important factor in acid soils. Iron and zinc show antagonism, and zinc may cause iron deficiency in solution cultures and soils, particularly in acid soils. Iron and copper also display antagonism, and copper may affect the availability of both iron and manganese to plants. Cobalt may also cause iron deficiency, and iron nutrition appears to be affected by the magnesium status and calcium-potassium ratio in the nutrient medium. Iron deficiency results in the presence of high proportions of soluble nitrogen in the leaves of plants. It appears that not only the availability of the iron but also the factors governing its absorption into and mobility within the plant are important.

KEYWORTH (W. G.) & DAVIES (D. L. G.). **Nettlehead disease of the Hop.**—*J. Pomol.*, xxii, 3–4, pp. 134–139, 1 pl., 2 figs., 1947.

In this account of investigations into the graft transmission of nettlehead virus disease of hops [*R.A.M.*, iv, p. 634; xxiv, p. 287] and its incidence in commercial plantations, the authors state that affected plants first become distinguishable in April and May, shortly after the bines begin to grow. On such plants the bines are rigid and the internodes shortened. The leaves stand out stiffly and the edges are curled upwards. When the bines are thinned and trained up the strings the contrast between healthy and nettlehead plants becomes less evident. As the bines grow, however, the leaf-curl symptoms again become visible, while the bines lose their ability to climb and fall away from the strings. They become brittle and turn a dull yellowish-brown. The basal lobes of the new leaves are small or lacking, and thus resemble those of nettles. Their lower surfaces are greyish and the veins are prominent with short translucent portions. The bines die back from the tips, there is often marked veinbanding, and the leaves then turn yellow and die. On severely affected hops the cones are few and small, but on others the crop may approximate to normal, though the bracts and bracteoles are usually distorted. The disease weakens the plant year by year; the centre of the stock rots and the new buds are confined to a thin rim of living tissue. On plants growing at high temperatures the symptoms are less conspicuous.

Field and greenhouse grafting experiments were carried out on Fuggles hops, using infected cuttings and complete plants from commercial plantations. The inarching method was used. Eighty grafts were successful, and 89 per cent. of these became infected (27 of 29 in the glasshouse and 44 of 51 in the field), though none of the controls in the glasshouse developed the disease, while 12 per cent. of those in the field were attacked, presumably as a result of natural infection. This result provides conclusive evidence that nettlehead is graft-transmissible. The only control measures that can at present be recommended are the roguing-out of diseased plants and the use of healthy planting stock. Roguing should be started as soon as the first symptoms are seen and should be continued throughout the season. In small outbreaks, all plants next to affected ones should also be removed. Experience has demonstrated that by planting nettlehead-free stock not less than a quarter of a mile distant from neighbouring hops a healthy stand can be maintained for many years.

MCMARTIN (A.). **Sugarcane mosaic disease and Maize growing.**—*S. Afr. Sug. J.*, xxxi, 1, p. 35, 1947.

To confirm the suspicion that the maize aphid, *Aphis maidis*, is primarily responsible for the spread of the sugar-cane mosaic virus in Natal [*R.A.M.*, xxvi, p. 215 and next abstract], two small plots, consisting of short lines of healthy Co. 281

alternating with the same variety from infected stools, were planted in fields in different parts of the Mount Edgecombe Experiment Station on 9th November 1946. In one plot maize was interplanted with the cane. By the following 10th January the disease had already begun to spread in the plot interplanted with maize, seven new cases of infection being found which on the 22nd had risen to 14. *A. maidis* was prevalent on the maize, some 40 per cent. of which showed mosaic-like symptoms, and isolated specimens could be detected on the canes. On the other plot no spread had taken place by the 22nd. This experimental demonstration of the risk of growing maize in proximity to sugar-cane lends further weight to the recommendation already made for the avoidance of the practice.

D[ODDS] (H. H.). **The incidence of mosaic disease. Influence of Maize : control measures.**—*S. Afr. Sug. J.*, xxxi, 2, pp. 81–82, 1947.

With further reference to the development of mosaic in the maize and sugar-cane interplanting experiment [see preceding abstract], the number of new cases of infection on sugar-cane in the plot containing maize had risen from 14 on 22nd January 1947 to 19 on the 27th and 26, 44, and 67 on 3rd, 10th, and 17th February, respectively, the corresponding figures for the surrounding cane being 19, 35, 59, and 72, respectively. In and around the plot without maize the cane remained healthy until 10th February, when two cases were observed in the plot itself and one in the vicinity, the corresponding figures on the 17th being three and two, respectively.

In the course of an examination of the Experiment Station fields by D. J. Retief, the Government Disease Inspector, proceeding at the time of writing in February, 1947, the incidence of mosaic was found to have been reduced from 20 per cent. and upwards in the previous season to less than 1 per cent. by the planting of selected cane. The disease was found for the first time on N : Co. 310, N : Co. 291, N : Co. 328, Co. 328, Co. 313, Creole, and B.726.

MAYOR (E.). **Mélanges mycologiques. II.** [Miscellaneous mycological notes. II.] —*Ber. schweiz. bot. Ges.*, lvi, pp. 656–672, 3 figs., 3 graphs, 1946.

In 1940 and 1941 the author observed in the canton of Neuchâtel *Taphrina athyrii* on the living fronds of *Athyrium filix femina*. The fungus causes pale yellow, later very dark brown spots, isolated or confluent, round or elongated, and affecting the whole or part of the leaflet but without causing distortion. The asci, present on both surfaces but usually only on the lower, were hyaline, and measured 12 to 24 by 5 to 8 μ, being wider in the middle. The spores are hyaline and elliptical, and measure 4 to 6 by 3 to 4 μ.

In September 1936, the greater number of some hundreds of *Chrysanthemum cinerariaefolium* plants growing, apparently wild, in a remote part of the canton of Vaud in the defile of the Orbe were found to be infected by *Puccinia gaeumanni* n.sp. Spermogonia were not observed. The primary uredospores were light brown, round or roughly round, 21 to 26 μ in diameter, or oval-elliptical and 26 to 35 by 12 to 26 μ. Three (two to four) germ pores up to 5 μ high are present; the wall is 2 to 3 μ thick, darker brown than the rest of the spore, and finely echinulate. The hyaline stalk measures up to 35 by 5 to 7 μ. The hyaline, filiform paraphyses measure 45 to 70 by 2 to 3 μ.

The secondary uredospores are round, ovoid, or more generally oval-elliptical, light brown, and measure 23 to 33 by 17 to 26 μ. In other respects they resemble the primary uredospores the hyaline pedicel being up to 23 by 4 to 5 μ. The paraphyses also are similar. The oval-elliptical teleutospores, which are rounded at either extremity, often become narrow at the point of insertion of the pedicel; they are not constricted at the septum, or not conspicuously. They measure 33 to 54 by 16 to 28 μ; the upper cell is 16 to 28 by 21 to 28 μ, the corresponding

figures for the lower one being 16 to 28 by 16 to 24 μ. The wall is 2 to 3 μ thick, being up to 9 μ thick at the tip. The hyaline pedicel measures up to 90 (35 to 47) by 4 to 7 μ, and the hyaline, filiform paraphyses measure 45 to 70 by 2 to 3 μ.

All attempts to infect *C. cinerariaefolium* with the teleutospores and uredospores of two other fungi of the same group, viz., *P. balsamitae* and *P. tanaceti*, failed. This result suggests that *P. gaeumanni* is of biological interest.

Moldenke (H. N.). **A contribution to our knowledge of the wild and cultivated flora of Pennsylvania.**—*Amer. midl. Nat.*, xxxv, 2, pp. 289–399, 1946.

Fungi are included (pp. 296–303) in this annotated list of over 4,000 collections of Pennsylvanian plants.

Moldenke (H. N.). **A contribution to our knowledge of the wild and cultivated flora of Ohio. II.**—*Amer. midl. Nat.*, xxxv, 3, pp. 779–792, 1946.

The 333 collections of Ohio plants represented in this instalment included a number of fungi, which are listed on pp. 781–785.

Teng (S. C.). **Additions to the Myxomycetes and the Carpomycetes of China.**—*Bot. Bull. Acad. sinica*, i, 1, pp. 25–44, 1947.

In this supplement to S. C. and K. L. Teng's 'Contribution to our knowledge of the Myxomycetes of China' (1937), the species not previously reported are described in detail, while the further distribution of those already published is shown in an appendix. The new records include *Sorosporium paspali* [*R.A.M.*, xv, p. 829] on *Paspalum scrobiculatum*, *Puccinia iridis* on *Iris*, *Armillaria mellea* on the base of a living *Salix* trunk, and *Chrysomyxa tsugae-yunnanensis* Teng n.nom. on *Tsuga yunnanensis*. The last-mentioned was described in 1940 as *C. tsugae* [ibid., xxi, p. 45], but this name was found to have been applied previously by Hiratsuka to a different rust on *T. sieboldii* [ibid., xvii, p. 347], necessitating a change in the designation of the author's species.

Rogers (D. P.). **Fungi of the Marshall Islands, Central Pacific Ocean.**—*Pacif. Sci.*, i, 2, pp. 92–107, 2 figs., 1947.

This is an annotated list of 34 species of fungi, of which two are new, collected on the Marshall Islands in the Pacific Ocean during 1946 by an expedition from the University of Hawaii. Further reports are expected to be issued.

Velenovský (J.). **Novitates mycologicae novissimae.** [The latest new mycological finds.]—Botanical Society of Czechoslovakia, Prague, 158 pp., 1 pl., 1947.

This contribution (Volume IV of 'Opera Botanica Čechica') to the study of Czechoslovakian Discomycetes (60 pp.) and Basidiomycetes, chiefly Agaricaceae (74 pp.) and a few Polyporaceae, Clavariaceae, and Gasteromycetes, comprises Latin descriptions of genera and species, several of the former and a very large number of the latter being new.

Teixeira (A. R.). **Himenomicetos brasileiros. III (Agaricaceae).** [Brazilian Hymenomycetes. III (Agaricaceae).]—*Bragantia, S. Paulo*, vi, 4, pp. 165–188, 10 pl., 1946.

In this further contribution to the knowledge of Brazilian Hymenomycetes [cf. *R.A.M.*, xxvi, p. 81] the author records the occurrence of *Schizophyllum alneum* [*S. commune*] on a number of plants, including *Achras sapota*, birch (*Betula papyrifera*), orange, coffee, persimmon (*Diospyros*) [*kaki*], *Eucalyptus*, cotton, *Jatropha*

curcas, *Liquidambar* sp., cassava, sugar-cane, and cacao, and lists five species of *Lentinus* (one new) with critical annotations.

BATKO (S.). **Biometrical researches of secondary spores and a study of the mycelium of Pholiota adiposa Fr., P. heteroclita Fr., P. mutabilis (Schaeff.) Fr., P. spectabilis Fr., and P. squarrosa (Müll.) Fr.**—*Trans. Brit. mycol. Soc.*, xxix, 4, pp. 242–249, 1 fig., 1946.

The secondary spores [conidia] of five species of *Pholiota* are described, with a discussion of the statistical significance of their differences in size. In *P. adiposa* [*R.A.M.*, xxi, p. 59; xxiv, p. 169] these organs on both the aerial and submerged mycelium were ellipsoidal, ovate or almost orbicular, with thin walls and crystals. The mean length (100 spores) was 6·5 and the mean breadth 4·1 μ of the aerial ones and 6·2 and 4·2 μ of the submerged. In *P. heteroclita* and *P. mutabilis* [ibid., xxi, p. 58] no conidia formed. In *P. spectabilis* the conidia on the aerial mycelium were almost orbicular, and about half of them had walls 1 to 2 μ thick; those on the submerged mycelium were thin-walled. The mean measurements of the former were 12·1 by 10·9 μ and of the latter 15·3 by 13·9 μ, while the conidia on hyphae in wood were 11·8 by 10·5 μ. In *P. squarrosa* [ibid., xviii, p. 360] aerial conidia were very rare; on the submerged mycelium they were 11·9 by 5·9 μ, thin-walled and variable in form, usually pear-shaped, though others were ellipsoidal or orbicular, and some narrowed in the middle.

Differences in the mean measurements of the secondary spores as between the different species were all found to be statistically significant, except for the difference between the mean length of those of *P. spectabilis* on the aerial mycelium or in wood and the length of those of *P. squarrosa*.

MATSUMOTO (T.). **Tobacco diseases in Formosa.**—*Mem. Fac. Agric. Taiwan Univ.*, i, 1, pp. 1–26, 11 pl. (1 col.), 1946.

The author has been engaged since 1939 on the investigation of tobacco diseases in Formosa, where the crop is of major importance. Present on the island are the tobacco mosaic, necrosis, ring spot, and leaf-curl viruses, while a composite disease observed under glass is thought to be identical with the double-virus streak of tomato [mixed-virus tomato streak caused by tobacco mosaic virus+potato virus X: *R.A.M.*, xvii, p. 73; cf. also xxvi, p. 84].

Bacterial diseases comprise Granville wilt (*Bacterium* [*Xanthomonas*] *solanacearum*, hollow stalk (*Bacillus* [*Erwinia*] *aroideae*) [ibid., vii, p. 121], and (?) wildfire [?*Pseudomonas tabacum*]: at the time of writing the organism had not been isolated from the brown spots with a yellowish halo, so its exact determination must await further investigation. According to Okabe's investigations in Formosa (*Bull. Sch. Agric. For. Taikoku*, iii, pp. 50–65, 1942), *X. solanacearum* falls into at least four distinct types, viz., F, Op, C, and SS, differing in colony characters. Inoculations with F and SS result, after about ten days, in the destruction of the pith and consequent formation of central cavities, while Op and C cause the death of the plants in about a fortnight without any preceding discoloration of the pith. The mild type C tends to be converted in the host tissues into the virulent F, with a corresponding change in the symptoms.

The crop is affected by the following fungal diseases: damping-off (*Pythium debaryanum*), black shank (*Phytophthora nicotianae*), powdery mildew, caused by *Erysiphe tabaci* Saw. [*R.A.M.*, viii, p. 199] (syn. *E. cichoracearum* p.p.), *Sclerotinia* disease (*S. sclerotiorum*), sore shin, *Corticium vagum* (*Rhizoctonia* [*C.*] *solani*), frog eye (*Cercospora nicotianae*), *Alternaria* leaf spot, attributed by Sawada [loc. cit.] to *A. tabacina* but regarded by Takimoto (*J. Plant Prot.*, xxi, pp. 494–500, 1934) as due to *A. longipes* aff.; anthracnose (*Colletotrichum*? *tabacum* Böning) [cf. *R.A.M.*,

xi, p. 753], and sooty mould (*Fumago vagans*). In the author's experience, much of the damage commonly ascribed to *P. nicotianae* is actually caused by *X. solanacearum*, but further studies are necessary to determine the relative importance of the two pathogens in connexion with black shank. Evidence has been obtained of extensive physiologic specialization in *Corticium solani* [cf. ibid., xx, p. 591], the strains isolated by the writer from tobacco, cotton, and castor bean [*Ricinus communis*] differing more or less widely in morphological and physiological features, as also did Okabe's isolate from *Stephania cepharanta*. Takimoto has shown that in Japan the greyish-white lesions produced on the leaves by *Cercospora nicotianae* are readily distinguishable from the reddish-brown areas typical of infection by *Alternaria*. In Formosa, however, the brownish spotting associated with the former species is very liable to confusion with the symptoms of the latter. Pending availability of the original descriptions of *Colletotrichum nicotianae* Averna-Sacca and *C. tabacum* Böning [ibid., viii, p. 680], the agent of anthracnose in Formosa cannot be determined with certainty, and its provisional attribution to the latter species rests on Sawada's record in part XI of his 'Descriptive catalogue of Formosan fungi' (not yet published). The local strains differ in their temperature relations, one procured from the north-east, for instance, growing fairly well between 25° and 31° C., with an optimum at 28°, while Hirane's isolate from the south of the island (*Tabako Kenkyu-shiro*, xi, pp. 53–59, 1943) developed better at 31° than at 28°, and the Japanese collections of Takimoto (*J. Plant Prot.*, xxi, pp. 574–579, 1934) and Nakamura (*Bull. Hatano Exp. Sta.* 33, pp. 54–71, 1934) flourished at 27° and 25°, respectively.

Non-parasitic disorders include frenching [*R.A.M.*, xxv, p. 334], nitrogen and potash deficiency (ibid., xvi, p. 781], and albinism, characterized by the development on the leaves, and occasionally on the stems, of large, irregular creamy-white or pale greenish-yellow areas.

Cuzin (J.), Renier (A.), & Schwartz (D.). **Epidémiologie statistique de la mosaïque du Tabac.** [Statistical epidemiology of Tobacco mosaic.]—*C.R. Acad. Sci., Paris*, ccxxiv, 22, pp. 1579–1581, 1947.

This is a description of a method applied by the authors at the Tobacco Institute, Bergerac (Dordogne) over a three-year period to the statistical assessment of the incidence of the tobacco mosaic virus, which was shown experimentally to persist in the soil [see next abstract]. Attention was directed chiefly to the topographical distribution of the diseased plants, which fell into two well-marked categories, endemic and epidemic, the former represented by random infection appearing sporadically throughout the field, and the latter by definite foci connected in some way, as yet unexplained, with the performance of transplanting operations.

Bordeleau (R.). **La mosaïque du Tabac hiverne-t-elle dans nos sols?** [Does Tobacco mosaic overwinter in our soils?].—*Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 80–83, [? 1947].

In June, 1941, three plots were planted with tobacco at the Experiment Station, Assomption, Quebec, and at the Substation at St. Thomas. When the plants were 18 in. high they were inoculated with tobacco mosaic by [rubbing with] affected leaves, and a few days later 100 per cent. of the plants at Assomption had developed mosaic symptoms. In the autumn the plants in plot one were dug in to a depth of 6 or 7 in.; in plot two they were uprooted whole and stored in a frost-proof place; in the third they were left lying on the ground.

In the spring (1942) samples of the plants and soil were analysed by G. H. Berkeley at the Dominion Laboratory of Plant Pathology, St. Catherine's, Ontario. The Assomption material showed that in plot three the virus was present in quantity in the surface soil [*R.A.M.*, ix, p. 207; xvii, p. 139] and also in the subsoil (8 to

10 in. below the surface) between the rows, it was present to a slight extent on the surface and in the subsoil near the roots, it was abundantly present in the stems and leaves, and even more so in the roots. In plot one it was rare in the surface soil and subsoil near the plants, and between the rows, and rather weakly present in the roots, stems, and leaves. In plot two it was very rare in the soil surface, though rather strongly present in the plants.

In the spring of 1942, healthy tobacco was planted in the three plots at Assomption, the plot where the plants had been left lying on the ground being disked; a fourth plot on which the remaining plants from indoors had been spread and disked into the soil was also planted. Precautions were taken against introduction of the disease from other sources. In autumn, these four plots showed, respectively, 6·9, 1·4, 1·4, and 15·2 per cent. mosaic-affected plants.

In 1942, new plots were planted at both sites and inoculations were 100 per cent. successful. In the autumn, the following treatments were carried out: plot 1, whole plants dug in, plot 2, whole plants disked in, plot 3, whole plants uprooted and left to dry in a place where they were exposed to winter temperatures, plot 4, plants left to winter on the ground and disked in the spring of 1943, plot 5, plants uprooted from plot 3, incorporated in the soil by disking in the spring. At Assomption, soil specimens from plots 1, 2, 3, and 4 were, respectively, negative, positive (trace), negative, and positive for the presence of the virus, the plant remains from the same plots being, respectively, positive, positive, positive, and negative, and the number of clean tobacco plants planted in June contracting mosaic being, respectively, 23, 15·7, 4·7, 40·5 per cent., and for plot 5, 36·6 cent. At St. Thomas, analysis of soil and plant remains from all plots gave positive results except in the case of the plants left on the ground, the clean plants in the plots corresponding to the Assomption experiment contracting 1, 0, 1·9, 7·6, and 8·7 per cent. mosaic, respectively. Further work is in progress.

When tobacco is planted following tobacco, therefore, there is a risk of maintaining or increasing mosaic [ibid., xix, p. 371], whatever precautions may be taken to reduce it. Rotation should be an important means of control; when tobacco followed tobacco for several years nearly 9 per cent. mosaic resulted, though the figure was under 1 per cent. when rotation was practised.

Selman (I. W.). **The localization of Tobacco mosaic virus in Tomato fruits.**—*J. Pomol.*, xxii, 3–4, pp. 226–230, 1 fig., 1947.

Tomato plants in the 13- to 14-leaf stage with the second truss in bud, growing in the ground under glass, were inoculated with yellow mosaic virus [a strain of tobacco mosaic virus] on 29th May, 1946, by wiping the terminal leaflet immediately below the first truss with infective juice. On 2nd July, 22 of 112 inoculated plants appeared to be virus-free, but when the inoculated leaflets were tested for virus it was found that only 17 were virus-free; one contained yellow mosaic, and four some virus in a very low concentration. On 16th July, when eight trusses had developed, tests were made again on the same 22 plants. Of the four plants previously found to contain little virus in the inoculated leaflet, one had virus in the first-formed fruit of the lowest truss, though none had any in the young leaves. Examination of the green fruits on the yellow mosaic plant showed that those on one fork of the second truss contained virus and bore whitish blotches characteristic of yellow mosaic. Fruits of the first truss also contained the virus but appeared to be normal, while the terminal shoot above the eighth truss was without virus.

In 1945, potted tomatoes were inoculated in the same way with the yellow mosaic strain at the 18-leaf stage (three trusses in bud). Five weeks later, brown lesions developed on four green fruits of the lowest truss of one plant, though main and lateral shoots showed no sign of virus and tests on these shoots were negative. The pitted fruits were found to contain a green-mottle strain of tobacco mosaic, the

origin of this infection being obscure. The plant was stopped between the fifth and sixth trusses on 20th June, and on 14th July a top lateral shoot showed symptoms of yellow mosaic. It was concluded that a light infection of tobacco mosaic had been localized in the fruits of the lowest truss.

In order to test this hypothesis potted Potentate tomato plants in the three-truss stage on 17th April received the following treatments: (1) all trusses removed, no inoculation; (2) trusses left on, no inoculation; (3) all trusses removed, leaflet below first truss inoculated with diluted juice containing mild tobacco mosaic virus; (4) trusses left, similar inoculation; (5) all trusses removed, leaflet above first truss inoculated; (6) trusses left, leaflet inoculated as in (5). In those plants where a mosaic mottling in the tops became apparent within 19 days after inoculation the evidence indicated that the systemic spread of tobacco mosaic virus from the lower leaves to the main leafy shoot may be delayed six to ten days by the presence of developing fruit. On 15th May, eight of the inoculated plants, all with trusses present, in which mosaic symptoms had not been noted were tested and the virus was detected in the fruit of the lowest truss of all, and in the young leaves of all but two. The uninoculated plants with trusses also contained the virus in the oldest fruits of all and in the young leaves of all the plants except one. It is concluded that when tomato leaf juice infected with tobacco mosaic virus or the yellow mosaic strain is diluted with more than three times its volume of water and wiped on to single leaflets the virus becomes localized in the developing fruits.

CHAMBERLAIN (E. E.). **Tomato-streak. Its incidence in New Zealand and identity with single virus streak (Lycopersicum virus 1 of Smith, 1937—a strain of Tobacco-mosaic virus).**—*N.Z. J. Sci. Tech.*, A, xxviii, 4, pp. 225–233, 4 figs., 1946.

Tomato streak has been shown to be identical with single-virus streak, a strain of the tobacco mosaic virus [*R.A.M.*, xxiv, p. 493]. The incidence of the disease in individual crops in New Zealand may reach 70 per cent.: a survey of 54 glasshouse stands comprising over 200,000 plants in six districts revealed an average infection of 2·3 per cent. Under experimental conditions, transmission to tomatoes results almost invariably in the development of mosaic symptoms only. The physical properties of the tomato streak and tobacco mosaic viruses are in complete agreement and their host ranges are closely similar, but the two viruses may be differentiated by the symptoms they induce on tobacco, those of the former consisting of local lesions, sometimes followed by systemic necrosis. It is proposed to re-name the tomato streak virus '*Lycopersicum* virus 1 of Smith (1937)—a strain of tobacco mosaic virus'.

PELLETIER (R.). **Études préliminaires sur l'effet de certains arrosages appliqués dans le champ en vue de lutter contre l'anthracnose et le mildiou du fruit de la Tomate.** [Preliminary studies on the effect of certain spray treatments applied in the field for the control of anthracnose and mildew of Tomato fruits.]—*Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 94–98, 3 graphs, [? 1947].

In an experiment carried out in Quebec in 1943, John Baer tomato plants were sprayed on 15th July with a spore suspension of *Alternaria solani* and on 20th July with a mixed suspension of the spores of *A. solani* and *Colletotrichum phomoides*. One lot received two applications of Bordeaux mixture (2–2–32) followed by four at 4–4–32; a second (designated fermate I) received six applications of fermate (2–80); and a third (fermate II) three applications at the same concentration. In the case of the Bordeaux mixture and fermate I the quantities applied were 80 to 90 gals. per acre for each of the first two applications (29th July and 12th August), 140 to 150 for the next three (25th August, 6th and 15th September), and 80 to 90 for the final one (6th October); the applications of fermate II were at

the same rates as the last three applications of fermate I and were given on the same dates.

The results obtained showed that against all the diseases that developed (*C. phomoides*, *Phytophthora infestans*, *A. solani*, *Oospora lactis*, *Rhizopus* spp., etc.), considered generally the best treatment was the Bordeaux; against *C. phomoides* only [see next abstract] fermate I was best; against *P. infestans* [*R.A.M.*, xxvi, p. 220] the Bordeaux treatment was most satisfactory, fermate appearing to increase infection. Further work is in progress.

Wilson (J. D.). **Anthracnose and its effect on Tomato varieties.**—*Food Packer*, xxviii, 6, pp. 65–67, 1 fig., 1947.

A three-year study at the Ohio Agricultural Experiment Station on varietal reaction to tomato anthracnose [*Colletotrichum phomoides*: *R.A.M.*, xxvi, pp. 36, 220, and preceding abstract] is reported. In 1944, when the disease was of moderate severity, Earliana proved to be the most susceptible with 43·4 per cent. infection, followed by Victor (34·5), a group of six with 20 to 25 per cent., another group comprising Baltimore, Cobourg, and Rutgers (16 to 19), and John Baer (14·2). There was comparatively little infection in 1945, when the maximum of 21·8 per cent. occurred on Bounty. Fordhook Hybrid and Ponderosa were the only other varieties with more than 10 per cent., Cobourg showed 10 per cent., and a group including Baltimore, Marglobe, Pritchard, Scarlet Dawn, Stone, Valiant, and Jubilee less than 5, the last-named being the least affected (3). Of the 48 varieties tested in 1946, the most susceptible (in descending order) were Bison, Bounty, Earliana, Burbank, and Grothen's Globe, and the most resistant (in an ascending scale) Gold Ball, New Stone, Dwarf Stone, Jubilee, and Stokesdale. As a group, the ten pink varieties were the most susceptible (25 per cent. average infection), followed by the 33 red (17·2), and four yellow (8·7).

Fruits produced on vines of determinate growth were more susceptible than those on well-developed, indeterminate plants (an average of 41·5 per cent. on six determinate varieties compared with only 11·6 on six indeterminate ones).

The average infection on six of the earliest varieties was 30 per cent., as against only 13 on another group maturing later. On yet another group of six varieties with relatively sparse and open foliage, 38 per cent. of the fruits were diseased compared with only 18 on six with dense, heavy foliage. In a further test comparing 14 varieties almost or wholly defoliated on 15th September with the same number retaining about half their leaves, the former showed 41 and the latter 24 per cent. for the entire season and yield increases from spraying were 67 and 36 per cent., respectively. It would appear from these observations that susceptibility to anthracnose is enhanced by excessive exposure to sunlight and early contact with the soil. Sunburned fruits tend to develop myriads of small cracks, and the epidermis and its protective cuticle may be worn thin by soil abrasion or biological and chemical action, facilitating the entry of the fungus.

The average degree of anthracnose control obtained by spraying all 48 varieties with zerlate in 1946 was 84 per cent., while the average yield of saleable fruit was increased from 5·2 to 8·2 tons. Of five popular commercial varieties included in all three years' trials, Garden State was the most susceptible, Cobourg second, Stokesdale and Rutgers close thirds, and Baltimore showed the lowest percentage of diseased fruits. In the case of Garden State, infection remained within tolerable limits (an average of 7 per cent. in several experiments) during the first half of the picking season, while the vines were still sufficiently upright to hold most of the fruit off the ground and the foliage cover dense enough to protect it from the sun. During the latter half, however, the infection index increased rapidly (31·8 per cent.). The seasonal increase in infection was only about half as great in the other four popular varieties.

Moore (W. C.). **Bacterial canker of Tomato in England.**—*J. Minist. Agric.*, liv. 3, pp. 138–142, 2 pl., 1 map, 1947.

This disease caused by *Corynebacterium michiganense* [*R.A.M.*, xxvi, p. 69] was first reported in England in 1942. There were 11 outbreaks in 1944, nine in 1945, and four in 1946, making 36 places in all where it has occurred. The only way of identifying the disease with certainty is to grow out the bacterium from the plants. The organism was found only in some of the specimens taken from the suspected outbreaks from 1942 to 1945, but it became apparent that the disease has its distinguishing symptoms which differ from those of other tomato disorders. The symptoms of marginal browning, curling, and gradual withering of the lower leaves are not peculiar to bacterial canker but the following symptoms are: (*a*) withering and streaking of the leaflets on one side of the petiole while those on the other remain green and turgid; (*b*) the formation of yellow or brown dots in the shape of a horseshoe where an affected leaf is cut off flush with the stem; (*c*) the path of the disease in its early stages can easily be seen as a yellow, light or dark brown streak just inside the woody cylinder if the stem is cut lengthwise; (*d*) yellow or light brown streaks can often be seen inside the maturing fruits running from the stalks to the placenta, from which the bacteria ooze in little, yellow blobs when the fruit is squeezed; and (*e*) the symptom most characteristic but most rare in England is the presence on the fruit of a superficial, circular spot, about $\frac{1}{10}$ in. in diameter, with a raised, brown centre surrounded by a snowy-white halo in its typical form.

So far the loss due to the canker has been insignificant, no more than 2 acres under glass having been infected, which is less than 0·1 per cent. of the average annual area of the indoor crop. The status of the disease as a potential threat to the crop is uncertain but there is no present cause for alarm in glasshouses. The position is different for the outdoor crop as the incidence and severity of the disease vary. On eight farms or nurseries 0·25 to 10 per cent. of the plants were affected, while on one farm in Surrey (1943) 1,100 out of 8,000 plants of Hundred Fold had to be burnt by mid-August. In six of the ten confirmed outbreaks in 1943 the same variety, derived from the same seed source in a country where the disease is well known, was affected and further seed distribution was banned. On the confirmation of the disease in 1943 the following measures were prescribed by the Ministry to prevent its spread. All infected plants, after removal of the fruit, were to be burnt together with string or other tying materials, and stakes used as supports to be sterilized by creosote, steam, or a 2 per cent. formaldehyde solution, no seed from the infested area was to be saved, and no tomatoes grown outdoors on infected land in the following year. These measures were evidently successful as the disease has not reappeared in areas thus treated. In the light of additional knowledge of the disease in 1946, official action ceased and advisory work took its place. Growers should now consult the local N.A.A.S. office if *C. michiganense* is suspected and should act as described above if the disease is confirmed on their premises.

Young (P. A.). **Tomato diseases in Texas.**—*Circ. Tex. agric. Exp. Sta.* 113, 66 pp., 32 figs., 1946.

In this circular, which replaces Nos. 82 and 86 in the same series [*R.A.M.*, xviii, p. 421; xix, p. 372], popular notes are given on the symptoms, causes, and control of 61 fungal, bacterial, virus, and physiological diseases affecting tomatoes in Texas, with a key showing the main symptoms and common names of the more important of them.

Miller (P. R.). **Warning service for late blight with special reference to Tomato.**—*Plant Dis. Reptr*, xxxi, 4, pp. 140–145, 1947. [Mimeographed.]

Following a resolution recommended at a special Tomato Conference at Indianopolis [*R.A.M.*, xxvi, p. 220], a warning service for late blight [*Phytophthora*

infestans: see next abstracts] was established in February, 1947, by the Plant Disease Survey of the Bureau of Plant Industry. It was designed primarily with reference to tomato, but it will be equally important to observe the potato crop, because of the reciprocal effect of the two hosts in the spread of the disease. Key pathologists, a list of whom is provided, send brief weekly reports on essential facts, such as dates and places of earliest appearance, weather of past week, spread to new areas, and losses incurred. The reports are assembled by the Plant Disease Survey into a warning letter and sent immediately to State key reporters. Anyone in a position to give helpful information should report direct to the key man in his State, rather than to the Plant Disease Survey.

Schroeder (W. T.). **Orthol K enhances control by zerlate of Phytophthora late blight on Tomato.**—*Plant Dis. Reptr*, xxxi, 5, pp. 191–192, 1947. [Mimeographed.]

In a field experiment at Geneva, New York, during 1946, fermate and zerlate at 2 lb. per 100 gals., with and without the adhesives omilite (polyethylene polysulphide) and orthol K, at 1 and 2 pints per 100 gals., respectively, were used on plots of tomato plants [*R.A.M.*, xxvi, p. 269]. Bordeaux (8–4–100) and non-sprayed plots served as controls. Four applications were made. Late blight (*Phytophthora infestans*) [see preceding abstract] appeared on the foliage of the non-sprayed plots at the time of the second application and continued to develop at a devastating rate, accounting for virtually all the reduced yield. The plants treated with Bordeaux yielded 20 tons per acre, with 5 per cent. infected fruit. The corresponding figures for zerlate with orthol K were 13·9 tons and 26 per cent. and without adhesive 4·4 tons and 72 per cent., respectively. All treatments gave significantly better results than the controls (2·2 tons and 78 per cent.).

Lincoln (R. E.) & Samson (R. W.). **Isolation of the Tomato strain of Phytophthora infestans from Potato tubers.**—*Plant Dis. Reptr*, xxxi, 4, pp. 145–146, 1947. [Mimeographed.]

The tomato strain of late blight (*Phytophthora infestans*) [*R.A.M.*, xx, p. 92] was isolated from Chippewa potato tubers grown at the Northern Indiana Experimental Farm at Walkerton, and from (?) White Rose tubers purchased from a store, originating from Caldwell, Idaho. Inoculated into tomato and potato foliage, this strain proved to be extremely virulent on both. The White Rose isolate was of equal or greater virulence compared with a tomato strain sent by Dr. G. Ruehle from diseased tomatoes in Florida, while the Chippewa isolate was less virulent.

Pomerleau (R.). **Inventaire pathologique de la forêt décidue à la Station Forestière Expérimentale de Duchesnay (Québec).** [A pathological survey of the deciduous forest at the Forestry Experimental Station, Duchesnay, Quebec.]—*Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 69–79, [? 1947].

A detailed survey of the deciduous trees at Forestry Experimental Station, Duchesnay, Quebec [*R.A.M.*, xxiv, p. 169], in which 3,147 trees from 10 to over 100 years old were examined, showed that 13·9 per cent. had some form of canker and 21·9 per cent. some form of decay. Most of the cankers were caused by *Nectria* spp., which were not further identified, the fungi responsible in Quebec, being, according to Lohman and Watson, *N. galligena*, *N. mammoidea*, and *N. coccinea* [ibid., xxiii, p. 47]. *Nectria* cankers were most frequent on wild cherries [*Prunus serotina*]; *Acer rubrum* is very susceptible to *N.* spp., followed by birch (*Betula lutea*). On *A. saccharum*, *Eutypella parasitica* [ibid., xxiv, p. 170] causes a form of canker the importance of which is second only to that due to *N.* spp. It is particularly prevalent on young, crowded trees. Cankers due to *Diatrype*

macounii, *Pholiota squarrosoides*, and *P. adiposa* were found for the first time in this forest [ibid., xxiv, p. 169].

The most common cause of decay (other than canker) was *Fomes igniarius*, to which the most susceptible trees locally are beech (*Fagus grandifolia*), *A. rubrum*, and aspen (*Populus tremuloides*). *Fomes connatus* is somewhat common on *A.* spp. *Ustulina vulgaris* sometimes causes decay and extensive cankering of *A. saccharum*, beech, and, occasionally, other trees. *F. applanatus* [*Ganoderma applanatum*] is particularly common, locally, on *A. saccharum*.

Other fungi, which are less common, but may under certain circumstances cause rather extensive damage, include *Polyporus glomeratus* on *A. saccharum* and beech, *Poria obliqua* and *Stereum murrayi* [ibid., xx, p. 184] on birch, *P. prunicola* mostly on *Prunus pennsylvanicum*, *F. conchatus*, the only cause of decay so far found locally on ash (*Fraxinus nigra*), and *Dibotryon morbosum* and *Armillaria mellea* on wild cherry. Non-parasitic diseases [ibid., xxiv, p. 38] affected 46·5 per cent. of the trees, *Acer rubrum* and beech being the most frequently damaged with *A. saccharum* and wild cherry next.

Riker (A. J.). **Some possibilities for developing resistance to disease in trees.**—*Amer. Nurserym.*, lxxxi, 12, pp. 5–7, 3 figs., 1947.

In this paper (condensed from an address to the Wisconsin Nurserymen's Association), the author mentions the more common methods used in plant disease control and discusses briefly the best general means for securing resistance. The paper concludes with a succinct review of the progress of work on the control of some of the principal tree diseases found in the eastern regions of the United States and the breeding of resistant varieties. Mention is made of a variety of red cedar, *Juniperus virginiana* var. Berg's rust resistant, now available commercially, which during five years in Wisconsin has remained almost completely resistant to *Gymnosporangium juniperi-virginianae* [*R.A.M.*, xxiv, p. 436] in the presence of rust-infested trees. Selections of white pine [*Pinus strobus*] highly resistant to blister rust [*Cronartium ribicola*: ibid., xxv, p. 586] are being propagated in Wisconsin and New York State while the resistant European currant Viking [ibid., xviii, p. 323] provides parental material for breeding work on the alternate host of this disease.

Zentymer (G. A.), Horsfall (J. G.), & Wallace (P. P.). **Dutch Elm disease and its chemotherapy.**—*Bull. Conn. agric. Exp. Sta.* 498, 70 pp., 2 figs., 9 graphs, 1 diag., 1 map, 1946.

Studies carried out since 1940 in Connecticut on Dutch elm disease (*Ceratostomella ulmi*) [*R.A.M.*, xxiv, p. 211; xxvi, pp. 177, 365], have shown that it has not been as destructive as had been feared, but necessitates learning how to 'live with the disease'. The most satisfactory solid medium for growth and spore production of the fungus was malt extract agar [cf. ibid., xxvi, p. 320]. The zonate character of the growth on agar plates was ascertained to be a response to light and dark periods (day and night). The most effective inoculation method was to introduce a spore suspension directly into the xylem vessels by means of cuts with a sharp knife. The inoculations became progressively more rapid and effective the nearer they were made to the base of the tree. Inoculations made during active spring growth were the most effective, as regards both the percentage of trees infected and the development of the disease in the tree. Summer inoculations were somewhat ineffective and mostly failed to carry over to the next season, but were more effective during a wet summer. The probability of infection was proportional to the number of spores used in the inoculation, small dosages causing no external symptoms or only light ones and trees generally outgrew the attack in the following year. Increase in the number of inoculation points also increased the effectiveness

of any given spore dose. Effectiveness of the spores in producing the disease appeared to decrease as the spores increased in age.

Toxin production by cultures of the fungus [ibid., xxi, p. 433] was favoured when asparagine was used as a nitrogen source.

Tree condition appears of great importance in the development of the disease. Elms severely defoliated by spring cankerworms (*Alsophila pometaria* and *Paleacrita vernata*) were much more seriously affected when inoculated than were non-defoliated trees. Trees fertilized with sodium nitrate or [complete] 10–10–10 fertilizers were less severely attacked than unfertilized controls or those given urea or ammonium sulphate. The most vigorous trees, regardless of type of fertilizer, were much less affected by the disease than those showing less vigour.

Studies on the rate of involvement of the tree showed a logarithmic dimensional equivalence of distance, time, spore load, and resistance of the vessels to transmission of water. The results did not quite agree with what would be expected from hydraulic theory, which postulates arithmetic dimensional equivalence of time, distance, and pressure. It is to be presumed that the lag that introduces the logarithmic factor is an exponential rate of vascular plugging due to the formation of tyloses and gums.

Intensification of the disease in a town was arithmetic with time. Infection has spread through Connecticut arithmetically with time at an approximately constant rate of 5·4 miles per year along radii of a circle centred at Battery Park, New York City, probably the original port of entry. The slopes of the curves showing the advance of the disease within a town or across the State since 1933, when the great roguing experiment started, do not become steeper for 1940, when roguing stopped.

Of over 100 organic chemicals tested against the fungus *in vitro*, the heterocyclic 8-hydroxyquinoline group [ibid., xxvi, p. 45] and the triphenyl methane dyes were the most effective. Chemotherapy studies [ibid., xxvi, p. 84] showed that hydroquinone, *p*-nitrophenol, benzoic acid, and dithane were also effective. Protection was conferred when these chemicals were injected into trees or were watered into basins at the base before inoculation, while in therapy experiments the same chemicals and pyrogallol similarly retarded infection. This retardation could be studied graphically, in comparison with untreated trees, from curves which showed that the progress of the disease in a tree during a normal growing season bore a linear relation to the logarithm of time when the percentages of infection per tree were plotted as probits against the logarithm of the number. Some of the treatments which markedly increased the time interval between inoculation and 50 per cent. infection were injections with 8-hydroxyquinoline sulphate and benzoate, hydroquinone, *p*-nitrophenol, pyrogallol, and quinone, most of which were administered at a concentration of 1 gm. per l. Curve slope and number of days required to reach a given disease level (50 or 95 per cent.) should both be considered in estimating the efficiency of a chemical.

Pruning at a very early stage 2 or 3 ft. below the last visible discoloration in the wood invariably prevented a recurrence of infection.

Wide variation was observed in the response of seedling American elms (*Ulmus americana*) to artificial inoculation with *C. ulmi*, indicating that it should be possible to develop a resistant American elm.

Pomerleau (R.). **The Dutch Elm disease in Canada.**—Abs. in *Proc. Canad. phytopath. Soc., 1946*, 14, pp. 15–16, 1 map, 1946.

During a complete survey in 1945 of the distribution of Dutch elm disease (*Ceratostomella ulmi*) [see preceding abstract] in eastern Canada [*R.A.M.*, xxvi, p. 330] 18,000 trees were examined and samples taken from 2,227 in the Province of Quebec. Of these latter, 1,321 showed the presence of *C. ulmi*, 365 of *Dothiorella*

ulmi [ibid., xx, p. 608], 15 of *Verticillium albo-atrum* [ibid., xxii, p. 219], and 318 of miscellaneous fungi. Samples from other provinces did not yield *C. ulmi*.

This first complete survey showed that at least 24 counties are affected by the outbreak, which covers a total area of about 7,000 sq. m. The gap of over 200 miles separating the Canadian from the United States outbreak suggests that there is no direct connexion between the two centres of distribution. There is reason to believe that infected material reached the port of Sorel from Europe several years ago.

Goidànich (G.). **La 'necrosi corticale' del Pioppo causata da Chondroplea populea (Sacc. et Br.) Kleb.** [Bark necrosis of Poplar due to *Chondroplea populea* (Sacc. & Br.) Kleb.]—Reprinted from *Riv. cellulosa*, xviii, 5, 29 pp., 2 col. pl., 24 figs., 1940. [Received June, 1947.]

In this paper the author gives a comprehensive account of poplar canker due to *Chondroplea populea* [*R.A.M.*, xii, p. 790; xvii, p. 569] (for which the name *Dothichiza populea* [ibid., xxv, pp. 153, 586] has generally been preferred), based on the literature up to 1940 and on his personal observations in different parts of Italy. The points dealt with comprise the history and geographical distribution of the disease, macro- and microscopic characters, host range, injury caused, the morphological and cultural characters, biology, and systematic position of the causal organism, etiology, effect of environmental conditions and cultural practices, transmission by inoculation, and control.

The disease, first reported from France in 1903 [cf. ibid., iii, p. 244], was recorded from Piedmont in 1906, where it had been present, probably, since 1902. By 1940, it had spread to every part of Italy except for a few regions in the south. It attacks nearly every kind of poplar widely used in Italy. The disease caused up to 90 per cent. mortality in Cremona province and the Alta Valle di Nure in 1936, up to 95·5 per cent. at Belgioioso (Pavia) in 1938 [ibid., xix, p. 68], up to 70 per cent. at Collobiano in the same year, and up to 50 per cent. at Casale Monferrato among Canadian poplars in plantings containing several hundreds. One worker has reported [1939] that in a plantation of Canadian poplars at Alberi di Vigatto (Parma) incidence rose from 10 to 95 per cent. between 23rd March and 8th April.

Saccardo's description of the fungus, under the name *D. populea* (*Sylloge*, iii, p. 672), is in some respects incomplete. The fructifications are 250 to 2,000 μ in diameter and 250 to 600 μ high, and are sunk in the matrix or rise only slightly above it. They consist of a stroma of which no trace remains when the pycnidia are mature except for protuberances or column-shaped appendages which sometimes arise in the pycnidial cavity. The wall has a plectenchymatous, in places occasionally a hyphenchymatous, structure, with cells up to 25 by 4 to 6 μ. The opening is brought about by the tearing or contraction of the upper part of the wall and is sometimes so wide open that it is doubted whether the fungus can be included in the Sphaeropsidales. The conidiophores form a thick lining in the pycnidial cavity. They are simple and unicellular or, more often, branched and multicellular, straight or flexuose-recurved. The terminal part, separated from the rest by a septum, is always awl-shaped and measures 18 to 30 by 3·2 to 4 μ. The abundant conidia, produced in waxy-mucilaginous cirrhi, are unicellular, colourless, opaque, usually ovate-piriform but also spherical to ellipsoidal, 9 to 13 by 7 to 9 μ, and distinctly attenuated at the point of attachment to the conidiophore. Germination takes place in a few hours. Fruiting is abundant and can occur at any time of the year, except in periods of extreme drought, both on living and dead parts of the host.

The morphological characters of this fungus are such that it can no longer be included in *Dothichiza*. The type species is *D. sorbi*, the structure of which (as studied by Klebahn on Libert's original material) has nothing in common with the poplar

organism; in particular, the shape and origin of the conidia are different. The suggestion that it might belong to *Discula* has been criticized by Klebahn, who renamed the fungus *Chondroplea populea*.

The fungus lives very well as a saprophyte, assuming a pathogenic character when it finds a weakened or susceptible host, or when the environmental conditions are favourable to it and unfavourable to the host. For these reasons the disease commonly attacks young trees not perfectly rooted, or which, after transplanting, are in a critical stage of growth. Under such conditions the disease may assume epidemic proportions in cold years, in waterlogged soils, or where the cultural conditions are unsatisfactory. Entrance takes place either through wounded or unwounded surfaces. The disease is favoured by low temperatures but humidity is unfavourable to it except in so far as by weakening the host it renders it more susceptible. Observations in one locality showed that 95 per cent. of the trees transplanted in autumn became affected, as against only 23·5 per cent. of those transplanted in spring.

When all the infection sites can be recognized with certainty, tree surgery offers a means of direct control, especially of older trees, but in actual practice preventive methods have to be adopted. Only cuttings from healthy trees growing in a district in which the disease has never appeared should be used and these must be planted promptly, if possible on the day they are made. If they have to be sent away or stored they should be disinfected with slightly acid 2 or 3 per cent. Bordeaux mixture. Layers should receive similar treatment. The nursery should be planted on fresh. well-aerated soil on which poplars have not been grown for some years. Routine roguing and spraying should be practised. It seems likely that Chiarabba's 'direct' method of planting out in the field may reduce the danger of epidemics during this critical period. Holes are made in early autumn, duly spaced, and filled in with the same soil mixed with fertilizer. About the middle of February, three cuttings, or unpruned, one-year saplings, are planted in each hole 5 cm. apart. When the shoots are 30 to 40 cm. tall, only one is left in each hole, the others being cut down level with the soil surface.

Plantations aged one to two years should be inspected carefully and rogued ruthlessly. In areas where the disease is present, the trees should be sprayed in winter with iron sulphate or Bordeaux mixture. If removal is not desirable in order not to spoil the regular arrangement of the plantation, the stem can be cut a little above soil-level and one of the shoots raised instead, the cut being disinfected. In all cases, strict hygiene is necessary. Preventive measures include the use of naturally resistant varieties and those developed by breeding and selection. These methods, carried out with care and promptitude, give every hope of successful control.

Bier (J. E.) & Buckland (D. C.). **Relation of research in forest pathology to the management of second growth trees. I. Poria weirii root rot, an important disease affecting immature stands of Douglas Fir.**—Reprinted from *B.C. Lumberm.*, [5 pp., folder], 5 figs., 2 maps, 1947.

Root rot of Douglas fir (*Pseudotsuga taxifolia*) trees caused by a form of *Poria weirii* [*R.A.M.*, xx, p. 97; xxi, pp. 508, 544; xxvi, p. 272] is general on Vancouver Island, along the mainland coast, and in the lower Fraser Valley; it has been found as far north as the islands in Johnstone Strait, as far east as Yale in the Fraser Valley, and in the interior at Revelstoke. Apparently, it is present throughout the northern range of Douglas fir. Other susceptible trees found in addition to those previously noted were Amabilis fir (*Abies amabilis*), Sitka spruce (*Picea sitchensis*), and western yellow pine (*Pinus ponderosa*).

Three $\frac{1}{4}$-acre areas of 35- to 40-year-old Douglas firs were marked out at Cowichan Lake in 1939 so that the spread of the disease from established infection centres

could be followed. In 1945, on the plot where the least fungal activity occurred, 21 per cent. of the expected increment of the dominant and co-dominant trees had been destroyed by the disease. Investigation of three sample plots of 60-year-old stands of Douglas fir near Yale in 1942 showed that decrease in the number of trees between 1935 and 1941 due to *P. weirii* root rot was, respectively, 38, 32, and 51 per cent., the corresponding figures for decrease in basal area being 0·8, 7·3, and 23 per cent. In a 44-year-old stand of Douglas fir, the first observation of the root rot was made in 1935, when two trees were killed by the fungus. In 1945, of the original 49 trees only 27 remained, 20 of the dead trees having been killed by root rot. Of the 35 original trees classified as dominant and co-dominant, 14 were killed by the disease. In 1935 the volume of the stand was 1,048 cu. ft.; in 1945 the expected volume was computed to be 1,430 cu. ft., but was actually only 919. Of the 511 cu. ft. lost, 504 cu. ft., or 134 per cent. of the expected increment, was lost through root rot.

As a rule trees are killed in groups, which results in stand openings that gradually increase in size. A 'distress' crop of cones, which are smaller than usual, is generally an indication of root infection. An infected tree may show these signs, accompanied by a gradual thinning of the foliage, for a year or two before the tree dies.

It is concluded that careful examinations should be made for the presence of this disease in all immature stands that are to be placed under management. Unless depletion from this cause is provided for as part of the management policy, grossly inaccurate figures may be obtained for all estimates of future growth and yield.

Bier (J. E.), Foster (R. E.), & Salisbury (P. J.). **Studies in forest pathology. IV. Decay of Sitka Spruce on the Queen Charlotte Islands.**—*Tech. Bull. Dep. Agric. Can.* 783, 35 pp., 10 pl., 1 diag., 2 graphs, 1 map, 1946.

This is an expanded version of the information already presented concerning the decay of over-mature Sitka spruce (*Picea sitchensis*) on the Queen Charlotte Islands, British Columbia [*R.A.M.*, xxvi, pp. 87, 223].

Peklo (J.). **K etiologii vývratů v jihočeských lesích Borových.** [On the etiology of wind damage in South Bohemian Pine woods.]—*Lesn. Práce*, xx, pp. 370–391, 2 pl., 6 figs., 1941. [German summary. Received May, 1947.]

In 1939 enormous losses were caused by wind damage in Czechoslovakian woods. Examinations made in the neighbourhood of Chlum near Třeboň in 1940 showed that numerous damaged pines [unspecified] had rotten roots and a strong smell of turpentine. The wood rot was identical with that caused by *Polyporus schweinitzii* [*R.A.M.*, xxiii, pp. 199, 321] found in the same locality, and it is presumed that in most cases the rot was caused by this fungus. In two samples of the rotten roots the author found *Trametes* [*Fomes*] *pini* [ibid., xxii, p. 413] and was able to prove its destructive activity microchemically and culturally. It is possible that *F. pini* was also responsible for windfalls.

Peklo (J.). **Příspěvky k biologii hub dřevomorných : z genetiky choroše Poria undata Bres.** [A contribution to the biology of some wood-destroying fungi: on the genetics of *Poria undata* Bres.]—*Lesn. Práce*, xxiii, pp. 290–326, 13 figs., 1944. [English summary.]

A. Pilát described in 1933 an unusual expansive growth of *Poria undata* [*R.A.M.*, xii, p. 410] in the railway-tunnel of Vinohrady in Prague. The author and his assistant investigated from 1934 to 1937 the ability of this fungus to attack railway sleepers. Isolations were made from oak sleepers and the tunnel wall. Pure cultures from single basidiospores showed that there were many strains, representing two

categories. One group formed more or less smooth, soft, raised, slimy, yellowish-white colonies. The mycelium was composed of coarse fibres easily budding into yeast-like elements, until finally the whole colony consisted of large, isolated, elongated or round cells. In some cases these continued to bud in a yeast-like manner. The other group formed compact, white or yellow to brown felt-like masses. They formed rhizomorphs, mostly of a complicated structure.

The yeast-like biotypes did not attack the wood of conifers or oak. The felt-like biotypes vigorously attacked unimpregnated beech, spruce, and to a lesser degree pine and larch wood. When beech wood was kept moist with 0·25 per cent. sodium carbonate there was no infection, but when disodium or diammonium phosphate (0·25 per cent.) was used profuse growth of the fungus was noticed, which was much greater than when water alone was used. Impregnated beech wood was hardly attacked, even when phosphates were added. Oak wood showed the greatest resistance to *P. undata*, although unimpregnated oak sapwood was vigorously attacked. The fungus attacks oak wood under conditions of great humidity and in the presence of certain minerals, especially phosphoric acid and ammonia.

The great variability displayed by the numerous biotypes requires some adjustment in the international method of testing wood fungicides. The inoculum should be obtained by sowing basidiospores and not merely by means of isolations from the mycelial tissue.

From numerous further monobasidiospore isolations more varied biotypes were obtained. The cultures of these varied from a soft, felt surface growth, to one with an entirely smooth surface, quite hard and cartilaginous. Anatomical examination showed that both types belong to *P. undata*. Small, rudimentary, sterile fruiting bodies were obtained in culture for the first time. By pairing different isolations together fruiting bodies were formed which might produce basidiospores.

Dermott (W.) & Trinder (N.). **Brown heart in Swedes : a Cumbrian survey.**—*J. agric. Sci.*, xxxvii, 2, pp. 152–155, 1947.

Brown heart of swedes due to boron deficiency [*R.A.M.*, xxv, p. 244; xxvi, p. 90] seems to have become increasingly prevalent in recent years in Cumberland and is probably more common in that county and Westmorland than in any other part of the British Isles. A survey of the Cumberland swede fields in 1944 showed that 53 fields were affected, as against 42 unaffected, approximately half the recorded cases being severe. In general, the boron content of the deficient fields was under 0·3 parts per million, as against a mean of 0·38 for the fields with healthy crops, though some of the latter showed an available boron content of 0·3 parts per million or less. Most cases occurred on light soils, 61 per cent. of the affected fields and only 24 per cent. of the unaffected having soil lighter than medium in texture. Of all the affected fields, 52 per cent. had been limed since 1939, while of the healthy ones only 30 per cent. had been limed since that year. As little difference was found between the mean pH values of the affected and unaffected areas it would appear that recent liming is more important in inducing the condition than the actual pH value of the limed soil.

It seems that a prediction that swede brown heart may occur in a given field may be made from a knowledge of the available boron content of the soil, the soil texture, and liming history of the field.

Pendleton (R. A.), Finnell (H. E.), & Reimer (F. C.). **Sugar Beet seed production in Oregon.**—*Bull. Ore. agric. Exp. Sta.* 437, 23 pp., 7 figs., 1 graph, 1946.

So far plant diseases have not affected the sugar beet seed crop in western Oregon very seriously. *Ramularia beticola* [*R.A.M.*, xxi, p. 237] is prevalent in winter and early spring. *Cercospora beticola* [ibid., xxv, p. 324] occurs in warmer weather, but is less abundant. Some progress is being made in breeding for resistance to these

two diseases. A seed-stalk blight caused by *Phoma betae* [ibid., xxiv, p. 269] is responsible for considerable damage in some seasons. Sugar beet varieties resistant to *C. beticola* [ibid., xxvi, p. 39] also show resistance to both *R. beticola* and stalk blight. These diseases are not sufficiently serious to necessitate control measures, although in some areas some leaf-spot control is secured by spraying or dusting with copper fungicides. New plantings of sugar beets in fields directly adjacent to recently harvested seed fields have shown increased disease in the areas nearest to the old fields. Downy mildew (*Peronospora schachtii*) [ibid., xxiv, p. 173] occasionally causes considerable damage which may be severe in late autumn-planted beets. Black streak (? *Pseudomonas aptata*) [loc. cit.] is common in western Oregon but it has caused little damage except at Klamath Falls, where a high percentage of infection occurred in a few fields. Beet rust (*Uromyces betae*) [ibid., xxii, p. 284] is abundant in the Willamette Valley at times. Seedling diseases are unimportant and readily controlled by seed treatment. The local seed company customarily treats all seed with fungicidal dust.

Bjornseth (E. H.). **One year's results from dusting snap Beans to control anthracnose and leaf hoppers.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxviii, 3, pp. 191–193, 1946.

There have been several outbreaks of bean anthracnose [*Colletotrichum lindemuthianum*: *R.A.M.*, xxv, p. 199] in Michigan during recent years. In 1945 seed-dusting trials were made in areas where snap beans [*Phaseolus vulgaris*] were a major crop and where anthracnose and leafhoppers were usually common. After dusting with two applications of 3 per cent. DDT, followed by two of 3 per cent. DDT plus 10 per cent. fermate, three pickings were made, yielding a total of 223·45 bushels per acre as against 156·8 from non-dusted plots. As anthracnose was absent that year the fungicidal value of the fermate could not be determined, but its use in the late summer when anthracnose might develop would probably be justified. The cost of the dusting materials for 1945 worked out at $15 per acre.

Goidànich (G.) & Camici (Leontina). **Un parassita microsclerozíale, del tipo Sclerotium (Rhizoctonia) bataticola Taub., presente in Italia.** [A microsclerotial parasite resembling *Sclerotium* (*Rhizoctonia*) *bataticola* Taub. present in Italy.] —Reprinted from *Ric. sci. Ricostruz., Roma*, xvi, 11, 6 pp., 2 figs., 1946.

During 1946 a fungus resembling *Sclerotium bataticola* [*R.A.M.*, xvii, p. 115], the vegetative stage of *Macrophomina phaseoli* (not previously recorded in Italy) [but see ibid., xviii, p. 517], in its morphological characters and the nature of the infection it caused, was found on broad beans in Sardinia and French beans [*Phaseolus vulgaris*] at Loana, on the Riviera. In the first case the plants had dried up in either scattered or confluent patches in the plot, and in the second they had died off as a result of a progressive wilt. The first crop was being grown in rotation with cereals while the other had been preceded by chick peas [*Cicer arietinum*], which had failed.

In culture the fungus rapidly formed round colonies at first hyaline and finally an intense carbonaceous black with little, if any, aerial mycelium. Microsclerotia developed in profusion, measuring 90 to 120 μ in diameter in the strain from French bean and 105 to 150 μ in that from broad bean. The hyaline, septate hyphae, 2·5 to 3 μ in diameter, had numerous anastomoses; in proximity to the sclerotia they measured up to 7 μ in diameter.

On French beans the symptoms consisted of a diffused chlorosis of all the aerial parts, this being followed by sudden withering. The plants remained stunted and even the roots were dwarfed. In the final stage the surface of the stem from the first to the third internode and even of the underground part turned a light, almost gleaming, ash colour. The cortical tissues flaked off, leaving the woody cylinder

bare. Microsclerotia were present in all the affected parts, particularly in the medullary canal in the area of the collar. Reddish-brown, globose or depressed-globose, empty fruiting bodies were also found, with or without a short neck and showing a distinct ostiole; they measured 135 to 180 by 120 to 155 μ. Definite identification of the fungus is awaited.

M. phaseoli has been reported in the Mediterranean basin from Egypt, Syria, Palestine, Cyprus, and Tunisia, and also from Rumania; in 1938, a fungus thought to be *M. phaseoli* was found in Sicily, but the culture was mislaid during the war. If the fungus described in the present paper turns out in fact to be *M. phaseoli*, Italian agriculture will have to take note that it faces a very serious enemy, which is probably already widespread in the country.

Lavallée (E.). **Les méfaits du mildiou sur les Oignons porte-graines en 1943.** [The damage caused by mildew to seed Onions in 1943.]—*Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 25–28, 8 figs., [? 1947].

In 1942 and 1943 seed onions growing in the vicinity of Montreal were severely attacked by mildew (*Peronospora destructor*) [*R.A.M.*, xxiii, pp. 5, 474]. In the latter year the author found six fields in this locality completely ruined by the disease, though four nearby remained unaffected. Seed onions show the same leaf symptoms as onions grown for the bulbs, and like them develop secondary infection of black mould due to a species of '*Macrosporium*'. Spraying tests using Yarwood's formula (1 per cent. rosin with 2 per cent. commercial lime-sulphur in water) [ibid., xvii, p. 122] were carried out. The spray fluid adhered well. In one area spraying was begun on 14th July, when 50 to 60 per cent. of the stalks were slightly affected, but part of the field showed scarcely any infection. After one week, during which no rain fell, a second application was made. The third week was very wet, and the disease became as severe on the sprayed as on the unsprayed plants; almost all the stalks were affected and 75 to 80 per cent. of the crop was lost. The disease appears to be the chief handicap to the production of seed onions in Quebec.

Nelson (R.). **Dust fungicides versus formaldehyde in the control of Onion smut.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxviii, 3, pp. 226–247, 4 figs., 1946.

This account deals with experiments in controlling onion smut (*Urocystis cepulae*) [*R.A.M.*, xxv, p. 57] during 1943 and 1945 on commercial farms in the Gun Swamp area, Michigan, where the soils are heavily infested with the fungus. Arasan and fermate were used as seed dusts. Formaldehyde was applied as a 1 per cent. solution at 15 c.c. per ft. of row with the seed [ibid., xxiv, p. 305], which is the standard method for growers. In 1943 the dusts gave apparently better control (3 to 3·7 per cent. smut, 51 to 59 per cent. stand, 3 kg. yield) than the formaldehyde (11·8, 46·5, and 2·3). Formaldehyde gave very good smut control (2·3 and 4·2 per cent. smut; 13·5 kg. yield) in 1945, arasan being far inferior (7·6 and 6·7; 10·28). The inconclusive evidence from these experiments shows that dusts are neither superior nor equal to the standard formaldehyde method of controlling *U. cepulae* in soils with moderate to heavy infection. In light infections dusts have given adequate control. In small-scale trials arasan (1 lb. with 4 lb. seed) gave satisfactory control in heavy seedings for set production. Dusts should not be used on a large scale by farmers until more conclusive results have been obtained.

Bowser (P. H.). **Effects of DDT on cabbage maggot of Radish and on aster yellows and the leafhopper of head Lettuce: a progress report.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxviii, 3, pp. 194–200, 1946.

It was found that yields of marketable heads of Great Lakes and Imperial 456 lettuce from DDT-treated plots were greater than those from untreated, although these were quite high in spite of a higher infection with aster yellows virus. Four

successive crops in 1945 were treated with DDT as a protection against leafhoppers carrying aster yellows virus [*R.A.M.*, xxiv, p. 128], and in each case the greatest yields were obtained when a 25 per cent. DDT dust was used, although a 5 per cent. dust also gave good control. The number of disease-free lettuce heads declined from 88 per cent. in the first crop to 66 per cent. in the third, showing that as the summer progresses leafhopper damage, and hence percentage of yellows, increases up to the time of the September harvest. Imperial 456 was less susceptible than Great Lakes.

Townsend (G. R.). **Celery mosaic in the Everglades.**—*Plant Dis. Reptr*, xxxi, 3, pp. 118–119, 1947. [Mimeographed.]

Since 1932 the incidence of celery southern mosaic [strain of cucumber mosaic virus: *R.A.M.*, xxvi, p. 148] on the muck lands of Palm Beach County, Florida, has increased, and other types characterized by a milder chlorosis and thin, downward rolling leaves, and a filiform leaf type have appeared [ibid., xviii, p. 369]. Heavy losses were recorded in 1938, and a loss of 80 per cent. of the crop was sustained in 1939. The chief weed host in this case was *Commelina longicaulis*. Newly cleared muck lands were free from both this weed and the mosaic. The weed propagates very easily and is an excellent reservoir for the virus, which is transmitted by aphids. On one farm the crop was so seriously damaged between 1938 and 1943 that a programme for eradicating the weeds was put into force and later intensified by the addition of 2,4–D sprays in the last two years. This year less than 1 per cent. of a 200-acre celery crop was lost through mosaic compared with 100 per cent. infection and heavy losses sustained on weedy farms nearby.

Sarasola (A. A.). **Una enfermedad poco común de nuestros Cucurbitaceas cultivadas.** [An uncommon disease of our cultivated Cucurbitaceae.]—*Publ. tec. Dir. Agric., B. Aires*, ii, 6, pp. 1–9, 3 figs., 1944. [Received May, 1947.]

This is an account of the downy mildew of Cucurbitaceae (*Pseudoperonospora cubensis*), comprising observations on its symptomatology, the morphology of the causal organism and the germination of its conidia, the propagation of the pathogen, and control measures. The first record of the disease in Argentina by Renaco dates from 1916 (*An. Soc. cient. Argent.*, lxxxi, p. 64), and it was again encountered in 1941 on cucumbers, watermelons, and (?) vegetable marrows ('zapallo').

Atkins (F. C.) & La Touche (C. J.). **Disease caused by Verticillium malthousei Ware (brown spot, fungus spot, dry bubble).**—Mushroom Diseases Leaflet I, Yaxley, Peterborough, published by the authors, 2 pp., 3 figs., 1947. 1*s*.

Brief notes in summarized form are given on the mushroom [*Psalliota* sp.] disease cause by *Verticillium malthousei* [*R.A.M.*, xiii, p. 286; xxvi, p. 4], including characteristics, source of infection, prevention, control, and a scientific description of the causal organism.

Viennot-Bourgin (G.). **La culture du Champignon de couche. (Suite.) VIII. Dactylium dendroides parasite du Champignon de couche.** [The cultivation of the edible Mushroom. (Continuation.) VIII. *Dactylium dendroides*, a parasite of the edible Mushroom.]—*Rev. Mycologie*, N.S., xi, 1, *Suppl.*, pp. 4–6, 1 fig., 1946.

Cultivated mushroom (*Psalliota*) beds at Poligny (Jura), when they have been in production for a month or more, have for some years past become infected by *Dactylium dendroides* [*R.A.M.*, xviii, p. 779; xxii, p. 160]. Very diffuse at first, the hyphae soon form isolated patches 10 to 30 cm. in diameter, consisting of a felty layer 10 to 20 mm. thick on the surface of the beds. Tufts of conidiophores develop later. Mushroom production becomes greatly reduced or is arrested in the affected patches. If a few buttons appear on the infected sites they reach a height of

only 12 to 24 mm. and do not spread open. As the parasite develops, the stipe and the incurved edge of the pileus show a cobwebby mycelium consisting of loose tufts or small light bluish-grey parallel bundles connecting tangentially the pileus to the base. While most of the mushrooms, on emergence, bear very few traces of soil, the infected ones are recognizable not only by their reddish-grey, later brownish colour, but by the numerous grains of sand caught in the mycelial threads and accumulated on the surface. The infected sporophores rapidly mummify and turn brown. If a mushroom covered with a large amount of mycelium is cut longitudinally, the outermost part of the stalk and pileus is markedly blackish-brown along a regular band 1 to 2 mm. wide sharply delimited from the deep part of the sporophore. This part turns a light buff colour, except for the central part, which does not change. The base of the stalk becomes leathery and markedly necrosed.

Good control is given by using a paste consisting of bleaching powder and lime. Further tests are to be made with other materials containing chlorine.

Reitsma (J.) & Slooff (W. C.). **A disease of Eggplant fruits caused by Phytophthora parasitica Dastur and Phytophthora palmivora Butler.**—*Chron. Natur.*, ciii, 5, pp. 60–63, 3 figs., 1947.

The organisms isolated on standard media from rotten eggplant fruits near Buitenzorg, Java, in April, 1943, were identified as *Phytophthora parasitica* and *P. palmivora* [*R.A.M.*, x, p. 754]. On a common purple variety with oblong fruits the roughly circular, brown, water-soaked lesions, 0·5 cm. in diameter, rapidly expand lengthways, forming elongated patches. On roundish fruits of Black Beauty, on the other hand, the darker-coloured spots spread at a uniform rate in all directions, retaining their circular appearance. The underlying tissue is discoloured, sodden, and separated from the sound portion by an irregular brownish margin.

Wounded and intact fruits were inoculated with both fungi with positive results. The typical differences in the mode of development of the two species were clearly perceptible after 48 hours, *P. palmivora* producing small clumps of aerial mycelium scattered over the centre of the lesion, while the copious growth of *P. parasitica* covered almost the whole of the infected area.

Control measures should include spacing the plants 1 m. apart, soil hygiene, prompt removal of diseased fruits, and fortnightly applications of 1·5 per cent. Bordeaux mixture.

Avni (Y.). **Encore le 'court-noué'.** [Court-noué again.]—*Rev. Vitic., Paris*, xciii, 1, p. 6, 1947.

The author cites a case of vine court-noué [*R.A.M.*, xxvi, p. 226] observed by him in Palestine in January, 1938. A five-year-old vineyard suddenly developed a general wilting; no causal organism was found, but the symptoms agreed with those described for the disease, and the author's diagnosis was confirmed by experts. Of 1,200 ha. about 200 were affected, and most of the vines came from French nurseries. All the local nurseries were also found to be affected. After consideration of all the factors, permission was given to plant the vines from the affected nurseries in different parts of Palestine, and at the same time numerous healthy and court-noué plants were planted side by side. Dead vines were replaced by healthy ones without disinfecting the soil.

Dry conditions prevailed in 1938 and a few vines dried up. During pruning in 1939 some vines were found to be dead, or partly so. In the original nursery the remaining vines developed well and all signs of court-noué disappeared. Healthy vines next to diseased ones remained vigorous, and those affected with court-noué appeared to recover and have since remained normal. The vines planted where dead ones had been, grew well. Vineyards planted with vines from affected nurseries have remained in excellent condition.

The evidence adduced in the paper is considered to indicate that court-noué is not a parasitic, incurable disease.

Nysterakis (F.). **'Court-noué' et Phylloxera vitifoliae Fitch.** [Court-noué and *Phylloxera vitifoliae* Fitch.]—*Rev. Vitic., Paris*, xciii, 1, pp. 9–12, 1947.

After discussing the view that the virus causing contagious court-noué of the vine [see preceding abstract] (if the disease is, in fact, due to a virus) may, perhaps, be carried by *Phylloxera vitifoliae* [cf. *R.A.M.*, xix, p. 67; xxvi, p. 227], the author describes an experiment started in 1940 to ascertain whether these insects after feeding on the juice of affected vines are able to cause identical stunting of healthy vines. A thick layer of fine sand covered with 15 cm. of a soil very favourable to *P. vitifoliae* was put into pots. Healthy Aramon vine roots were planted in the soil, which was then covered with sand. At the end of spring and again at midsummer, leaves bearing *Phylloxera* galls from Rupestris du Lot stocks which had been affected with court-noué for many years were inserted and ten days later removed. During this period the plants were not watered.

The ensuing winter the roots of all the plants except one showed numerous swellings due to the insect. Later they were transferred to pots of healthy, disinfected soil. At planting-out most of the roots were removed and the entire plants thoroughly cleansed to remove any insects that might remain. At the time of writing, six years later, these plants show no stunting.

Petri in 1918 and Ravaz in 1928 both claimed transmission of the disease to healthy vines in the first or second year after their being contaminated by the soil or the roots of affected plants. The author has observed the symptoms of court-noué to develop in the same period, when the former method was used, but in these instances the affected vines showed no swellings.

It is considered that these facts demonstrate that *P. vitifoliae* is not a natural vector of the causal organism of contagious court-noué of the vine.

The author also draws attention to the fact that in many cases the general development of the disease is the same whether the insect is present or not in a vineyard. The literature shows that the disease was present in Europe long before the insect was introduced. But even if it can be proved that there was a recrudescence of the disease after the introduction of the insect, the fact remains that before this the causal agent must have been present in some organism other than the insect to account for the fact that new plantations and vines surrounding diseased ones became affected. The author has found the disease in Crete, where the insect is not present [ibid., xix, p. 454].

Blattný (C.), Novák (S.), Vielwerth (V.), Kac (A.), Starý (B.), & Ryžkov (N.). **Zpráva o škodlivých činitelích kulturních rostlin ve vegetačním roce 1940–41 v Čechách.** [Report on harmful factors affecting crops in Bohemia during the season 1940–41.]—*Ochr. Rost.*, xviii pp. 5–16, 1942. [Abbreviated German translation. Received January, 1947.]

Brief notes are given on diseases most prevalent in Bohemia, Czechoslovakia, during 1940–1: *Leptosphaeria herpotrichoides* [*R.A.M.*, xix, p. 337] occurred on rye, particularly when following clover and barley, and *Ophiobolus herpotrichus* caused considerable damage to early wheat where sown after barley and wheat.

Rozsypal (J.). **Zpráva o škodlivých činitelích kulturních plodin ve vegetačním období 1940–41 na Moravě.** [Report on harmful factors affecting crops in Moravia during the season 1940 41.]—*Ochr. Rost.*, xviii, pp. 17–24, 1942. [German summary. Received January, 1947.]

In Moravia, Czechoslovakia, in 1940–1 [*R.A.M.*, xvii, p. 500 and preceding abstract] stem-breaking of wheat caused by *Ophiobolus herpotrichus* was of epidemic

proportions. *Phoma betae*, *Pythium* sp., and *Corticium solani* caused considerable damage to beet, up to 20 per cent. in certain fields. Sugar beet was also attacked by *Bacterium tumefaciens* and to a lesser degree by *Cercospora beticola*.

Dey (P. K.). **Plant pathology.**—*Adm. Rep. agric. Dep. U.P., 1944–1945*, pp. 38–40, 1947.

During the period under review, all-India co-operative experiments demonstrated that seed treatments against jowar [sorghum] grain smut [*Sphacelotheca sorghi*: *R.A.M.*, xx, p. 289; xxiii, pp. 293, 294] with agrosan G, copper carbonate, Baluchistan sulphur, and fungus sulphur resulted in no significant differences in percentage infection, though all reduced it in comparison with the untreated controls. The incidence of arhar [pigeon pea] wilt [*Fusarium udum*: ibid., xxvi, p. 144] was reduced from 64 to 38 per cent. in a susceptible variety when it was grown mixed with sorghum. That potato ring disease [*Xanthomonas solanacearum*] can be successfully controlled by growing a thick crop of soy-bean the season before was again demonstrated at four places in the Naini Tal District.

On p. 20 of this report it is stated that the results of tests at Shahjahanpur showed that Co. S302, Co. S222, and Co. S163 sugar-cane varieties were the least susceptible to red rot [*Physalospora tucumanensis*: ibid., xxvi, p. 214].

On p. 25 it is stated that irrigation in the last week of February markedly increased rust (*Puccinia graminis* and *P. glumarum*) incidence on C. 13 wheat, the grain yield being reduced by about 13 per cent. A plot given only two well-timed irrigations showed 5 per cent. *P. graminis* and about 10 per cent. *P. glumarum*, and gave a grain yield of 21·5 maunds per acre, whereas an adjacent plot, given the additional late irrigation, showed about 20 and 40 per cent. infection by the two diseases, respectively, with a grain yield of only 19 maunds per acre.

Eastham (J. W.). **Report of Plant Pathologist.**—*Rep. B.C. Dep. Agric., 1946*, pp. W92–W100, 1947.

In this report [cf. *R.A.M.*, xxvi, p. 187] it is stated that plum black knot (*Dibotryon morbosum*) [ibid., xxiv, p. 375] seems to be increasing in the Lower Fraser Valley, British Columbia, and must now be regarded as a disease of major importance. Plum pocket or bladder plum (*Taphrina pruni*) [ibid., xvii, pp. 468, 609; xx, p. 123] also appears to be occurring more frequently, though reported only from the vicinity of Vancouver.

W. R. Foster states that the most important diseases in British Columbia in 1946 appeared to be little cherry [ibid., xxvi, p. 204], strawberry red core [*Phytophthora fragariae*: ibid., xxvi, p. 9] bunt (*Tilletia caries* and *T. foetida*) of winter wheat, potato late blight [*Phytophthora infestans*: ibid., xxii, p. 9], and *Verticillium* wilt of tomatoes (*V. albo-atrum*) [cf. ibid., xxiv, p. 169]. Little cherry is now one of the most important problems confronting the fruit industry of British Columbia. It has spread to almost every fruit-growing area of the Kootenays, and during 1946 was noted for the first time in Kaslo, New Denver, and Renata. Every tree appears to be affected in the districts of Nelson, Willow Point, Harrop, Proctor, Balfour, Queen's Bay, and Taghum. In a tree-to-tree survey of 24 orchards in the Creston district in July the number of affected trees ranged from 0 to 92 per cent. In this locality the disease is widely distributed and well established. The 'Canyon' district, across the Goat River from Creston, still appears to be unaffected. For some years past, spread has been too rapid for control by the regular removal of affected trees. Growers in the Kootenays are advised against making new plantings of cherries.

The most serious handicap to strawberry growers is red core, the loss in 1946 being estimated at 20 per cent. of the berries and 10 per cent. plants killed in the Fraser Valley. Efforts are being made to develop a suitable resistant variety.

Improvement in the drainage by ridging appears to mitigate the severity of the disease.

The Ridit and Hassar winter wheat varieties have now become susceptible to bunt in the Northern Okanagan, after being resistant for nearly 15 years. By far the most suitable method of control in this area is to use Wasatch, a new resistant winter wheat variety, though it will probably have to be replaced later on. Oro wheat is resistant to all races of *T. caries* but susceptible to one of *T. foetida*. Ridit is resistant to all races of *T. foetida* but susceptible to one race of *T. caries*. Experiments in the Northern Okanagan have proved that the percentage of bunt from soil-borne infection is very high from 15th September until the end of October. Early planting is therefore advised in addition to seed treatment and the use of a resistant variety.

V. albo-atrum was widespread on tomatoes in the Lillooet district, and in a number of fields nearly all the plants were attacked. Loss was estimated at about 35 per cent. on the whole. Foliage shedding induced by the disease exposed many of the fruits to sun scald. The control methods recommended include the use of clean seed (and seed dusting), raising the young plants under sanitary conditions, and six-year rotation. Incidence is closely related to soil and air temperatures; when low temperatures prevail, sudden wilting and premature death occur; when the temperature is moderately high, as it probably was at Lillooet, there is little foliage wilting, but the leaves develop yellow patches and slowly dry from the base of the plants upwards. At high temperature the attack slowly abates. Any cultural practice which increases temperature should reduce losses.

A directive sent to potato wholesalers in the State and which came into effect on 22nd April, 1946, states that any carload of potatoes found on inspection to have bacterial ring rot [*Corynebacterium sepedonicum*: ibid., xxvi, p. 187] will have to be returned to the country of origin.

Andre (F.), Barss (H. P.), & Rand (F. V.). **Experiment Station progress in insect and plant disease control, 1945.**—Reprinted from Report on the Agricultural Experiment Stations, 1945, 32 pp., 1946.

In the section of this report dealing with plant disease control (pp. 14–32) the authors present a valuable survey of the chief results obtained in 1945 in the different experiment stations throughout the United States. One section gives some striking examples of research results on disease control, while others deal, respectively, with the control of diseases of vegetables, grain, field and forage crops, and fruit. Much of the information has already been noticed in this review [cf. *R.A.M.*, xxv, pp. 181, 267, 330, 591, *et passim*], but a few examples may be cited. In three years' work in Indiana wettable sulphur proved the most effective treatment against potato scab [*Actinomyces scabies*: ibid., xxvi, p. 288]. In Ohio, fermate continued to surpass copper fungicides against tomato anthracnose [*Colletotrichum phomoides*: ibid., xxvi, p. 360]; alone 2 per cent. fermate caused only minor injury, but combined with copper-containing materials injury resulted; excellent control of both anthracnose and *Alternaria* blight [*A. solani*] was given, however, by using fermate and a fixed copper in alternating sprays. The best protection, with the highest fruit and foliage quality, was given by fermate combined with puratized N5D. In Hawaii, fermate was effective against both *A. solani* and *Stemphylium* [*solani*: ibid., xxv, p. 143].

Dithane has continued to show great promise. In Ohio in 1943 it was found effective against *Alternaria* blight [*A. solani*] of potato and tomato [ibid., xxv, pp. 331, 415], and controlled celery blight [*Septoria apii-graveolentis* and *S. apii*] about as well as copper sprays, though it gave mediocre results against tomato anthracnose, and poorer results than Bordeaux mixture against *Cercospora* and *Macrosporium* blights of carrot [*C. carotae* and *A. dauci*, respectively: ibid., xxvi, p. 409].

A spotting of wrapped tomatoes in cold storage in West Virginia was caused by *Pullularia pullulans*, not before recorded on tomato. In Oregon, a species of *Cercosporella* spread from wild turnips to the leaves of cabbages grown for seed. In 1943 and 1944 maize in Delaware showed a condition of undetermined origin in which the foliage became a brilliant red turning a purplish red over the whole plant, which produced no mature kernels, though ears might be formed; in one planting 37 per cent. of the plants were affected.

A lethal virus disease apparently new to science was reported from Oklahoma, where it caused about 75 per cent. loss in an experimental field of guar (*Cyamopsis psoraloides*).

Pady (S. M.), Johnston (C. O.), & Hansing (E. D.). **Kansas mycological notes : 1945.**—*Trans. Kans. Acad. Sci.*, xlix, 2, pp. 175–183, 1 fig., 1946.

Brief notes are given on new and interesting fungi found in Kansas in 1945 and on the local distribution and damage caused by some of the economically important plant pathogens [cf. *R.A.M.*, xviii, p. 374; xxii, p. 382].

Kulescha (Z.). **Comparaison entre la structure des néoformations provoquées par l'action de l'acide indole-acétique et du Phytomonas tumefaciens sur des fragments de parenchyma vasculaire de Topinambour cultivés in vitro.** [Comparison between the structure of the neoplasms induced by the action of indole-acetic acid and *Phytomonas tumefaciens* on the fragments of vascular parenchyma of Jerusalem Artichoke cultivated *in vitro*.]—*C.R. Soc. Biol., Paris*, cxli, 7–8, pp. 358–360, 2 diags., 1947.

A study of the comparative anatomy of the tumours in fragments of the vascular parenchyma of Jerusalem artichoke [*Helianthus tuberosus*] resulting from inoculation with *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xxvi, p. 289] and those induced by treatment with indole-acetic acid [see next abstract] revealed considerable structural differences. Both types of neoplasm contained cribrovascular bundles, which in the bacterial tumours, however, were disposed at random, contrasting with their regular arrangement in layers in the callus formations induced by the growth substance. These observations corroborate the opinion already formed, on the basis of previous studies, that the indole-acetic acid secreted by the pathogen is not the only factor involved in the development of tumours.

Gautheret (R.). **Action de l'acide indole-acétique sur le développement des tissus normaux et des tissus de crown-gall de Topinambour cultivés in vitro.** [Action of indole-acetic acid on the development of normal and crown-gall tissues of Jerusalem Artichoke cultivated *in vitro*.]—*C.R. Acad. Sci., Paris*, ccxxiii, 24, pp. 1728–1730, 1 graph, 1947.

Jerusalem artichoke [*Helianthus tuberosus*] stem tissues inoculated with crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) proliferated abundantly in a nutrient medium containing no indole-acetic acid, whereas normal tissues from the same source failed to grow in the absence of the heteroauxin [see preceding abstract].

Ropp (R. S.). **The growth-promoting and tumefacient factors of bacteria-free crown-gall tumor tissue.**—*Amer. J. Bot.*, xxxiv, 5, pp. 248–261, 29 figs., 1947.

The effect of *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xxvi, p. 335] on tomato, tobacco, and sunflower plants inoculated with the bacterium was to induce epinasty, suppression of lateral buds, and production of adventitious roots. Cultures *in vitro* of sunflower stem segments showed that at a distance of more than one internode from the tumour roots were produced, the root-stimulating influence evidently diffusing a considerable distance through the plant. Experiments with tumour-bearing stems of *Vinca rosea* which had been freed from their bacteria by

heat treatment indicated that the root-stimulating effect came from the tumour tissue rather than from the bacteria.

Evidence was obtained which indicated that bacteria-free crown-gall tissue generates a diffusible substance capable of stimulating growth in normal callus tissue but not causing any permanent change in the tissue. *In vitro* grafts showed that tumour tissue is capable of bringing about a proliferation in normal tissue to which it is grafted. In sunflower it took the form of well-organized spherical outgrowths with a woody core and differentiated cortex. In *V. rosea* the new tissue was less organized but contained pockets of xylem scattered throughout the mass. This tissue continued to grow *in vitro* and showed all the external characteristics of tumour tissue. It is concluded that a tumefacient agent is present in bacteria-free crown-gall tissue capable of converting normal into tumour tissue.

Hodgson (R.), Riker (A. J.), & Peterson (W. H.). **A wilt-inducing toxic substance from crown-gall bacteria.**—*Phytopathology*, xxxvii, 5, pp. 301–318, 2 figs., 1 graph, 1947.

Filtrates from cultures of crown-gall bacteria (*Phytomonas* [*Bacterium*] *tumefaciens*) induced in the leaflets of Bonny Best tomato and other plants, e.g., sunflower, marigold [*Calendula officinalis*], and peas, wilting followed by necrosis. Under standardized conditions the approximate quantity of toxin in the filtrates was measured by an assay involving filtrate concentration, solution intake, and severity of wilting (toxic index). The toxic substance was thermostable in neutral solution, labile when heated in strong acid solution, non-volatile, water-soluble, relatively insoluble in most organic solvents, and dialysable. After alcoholic fractionation of the filtrate, much of the toxic activity appeared in a fraction precipitated in 90 per cent. alcohol which consisted largely of a previously studied glucosan [*R.A.M.*, xxi, p. 409]. Pure preparations were tested and found to induce wilting similar to that of the entire filtrate. The toxic substance would seem, therefore, to be the glucosan.

Luria (S. E.). **Recent advances in bacterial genetics.**—*Bact. Rev.*, xi, 1, pp. 1–40, 1947.

The 184 contributions included in this survey of progress in the field of bacterial genetics are discussed under the headings of (I) analysis of spontaneous mutability, (II) increase in mutation frequency produced by non-specific agents, (III) bacterial mutation and the genetic determinants of bacteria, (IV) specific induction of mutations, (V) fusion and sexuality mechanisms, and (VI) selection phenomena and evolutionary considerations.

Pijper (A.). **Methylcellulose and bacterial motility.**—*J. Bact.*, liii, 3, pp. 257–269, 27 figs., 1947.

Solutions of methylcellulose sold as 'methocel' by the Dow Chemical Company provide a particularly suitable medium for the study of bacterial motility, as they possess sufficient viscosity to slow down the movement and allow detailed observation of it in slow motion. The precipitation of the colloid material on bacterial bodies and appendages is minimal, which is the special advantage of methocel over the solutions used hitherto for this purpose.

A study of motile bacteria of several groups under these conditions leaves no doubt that they propel themselves by means of undulating gyrating movement of their bodies and not by the flagella which are the product of motility and not its cause. The flagellum consists of the outer covering of the bacterium, which is mainly polysaccharide, and through the undulating gyrating movement of the body it is twisted off in the shape of a long spiral tail or as more or less numerous, thin, wavy threads. It appears, therefore, that motile bacteria can no longer be regarded

as rods (bacteria), but must be classed as something like spirilla. The term flagella for bacteria will have to be dropped and replaced by an expression such as 'polysaccharide twirls' or 'mucous twirls'.

Petit (A.). **Remarques biologiques sur les rouilles des céréales. Nouvelles observations sur les rouilles des céréales : moyens de préservation.** [Biological notes on cereal rusts. New observations on cereal rusts: protective methods.]—*Ann. Serv. bot. Tunis*, xvi–xvii, pp. 151–179, 1939–1940; xix, pp. 3–13, 1946. [Received April, 1947.]

In the first of these papers the author states that in Tunisia *Puccinia glumarum tritici* [*R.A.M.*, xxv, p. 388] develops on wheat early in December, *P.g. hordei* on barley towards the end of that month, *P. triticina* on wheat at the end of November, *P. graminis tritici* on wheat and *P.g. hordei* on barley early in February, *P.g. secalis* on rye, *P. coronata* on oats, and *P.g. avenae* on oats in November, *P. simplex* [*P. anomala*] on barley in December, and *P. dispersa* on rye in January. All except *P. g. hordei* and *P. g. tritici* begin to develop as soon as the cereal starts to shoot, the uredospore stage persisting through the winter. The evidence indicates, however, that the rust organisms have several different means of perennating. Wild grasses (except *Aegilops* spp.) seem to play a less important part in this respect than the volunteer shoots of the cereal between autumn and spring. The aecidial hosts are unimportant locally, the rusts developing in the field before the aecidia appear.

Preliminary greenhouse tests indicated that Thatcher and Mahmoudi 552 are highly resistant to *P.g. tritici*, while Roussia shows some resistance; those hard and soft wheats which appear to be resistant escape infection owing to their precocity and the rapid ripening of the grain, both factors depending largely on the sowing date.

P.g. tritici is less prevalent during April and May in certain cold northern parts of Tunisia than in the Sahel and the eastern coastal plains. Thus, the black rusts are found first in the centre and south of the Sahel, and the view that the spores travel from south to north appears to be justified.

In the second paper it is stated that the wheat, barley, oats, and rye strains of *P. graminis*, and *P. dispersa* on rye have been found in Tunisia at the beginning of September following rain. *P. triticina* is present before the autumn-sown wheat is gathered. The appearance of these fungi is attributed to the conservation of the uredospores *in situ*, to volunteer shoots bearing uredospores, and to air-borne infection. A wide extension of black rust may occur locally even without the intervention of wet weather. Transmission by means of volunteer plants occurs in certain years, when rainfall is sufficient, but if the season is dry the rusts do not live on from summer to autumn, re-infection then occurring by means of wind-borne spores. Wind-borne infection appears to be necessary for attack by *P. glumarum*. Most of the cereal rusts have been found locally in winter, summer, and before and during autumn, so that sources of infection appear to be always present. The possibility of control by chemical immunization of the host should be explored. The introduction into Tunisia of barberry should be forbidden. To avoid wheat black rust, late sowing should not be practised.

Chester (K. S.) & Preston (D. A.). **Experimental forecast of Wheat leaf rust in Oklahoma for 1947.**—*Plant Dis. Reptr*, xxxi, 5, pp. 201–203, 1947. [Mimeographed.]

The 1946 forecast for [brown] wheat rust (*Puccinia rubigo-vera var. tritici*) [*P. triticina*: *R.A.M.*, xxv, p. 551] proved to be right. The rust became abundant in Oklahoma just before maturity of the crop. In the autumn there was an unusually heavy epiphytotic on the new crop, but a severe frost (—16° F.) in early January

destroyed nearly all the overwintering spores. On later planted wheat there was better rust survival following the January freeze, but throughout January, February, and March the concentration remained low. Owing to very dry weather during March there was no brown rust increase during this month.

The extensive survey indicated a significantly lower concentration of rust on 1st April, 1947, than in 1945 or 1946. From these findings it is concluded that 1947 in Oklahoma will not be an abnormal year for brown rust and that it will not become seriously destructive, though it may be fairly abundant as the crop approaches maturity.

OORT (A. J. P.). **Stuifbrand specialisatie, een probleem voor den kweker. Onderzoekingen over stuifbrand, III.** [Specialization in Wheat loose smut, a problem for the breeder. Studies on loose smut, III.]—*Tijdschr. PlZiekt.*, liii, 2, pp. 25–43, 2 figs., 3 diags., 1 graph, 1947. [English summary.]

Three specific factor-complexes must be considered in a study of the relation between the wheat plant and the agent of loose smut (*Ustilago tritici*) [*R.A.M.*, xxv, p. 160]. In the first place, the intensity of infection may fluctuate with differences in varietal reaction to infection. For this type of susceptibility, which presumably depends on the rate of spread of the mycelium within the host, the name of 'spreading susceptibility' is proposed. It should not be confused with the susceptibility which includes all the factors determining the occurrence of the disease in the field. 'Spreading susceptibility' is assessed by the percentage of plants attacked and by the severity of infection on the individual plant as expressed, for example, in the number of smutted haulms. The two principles are correlated.

Secondly, irrespective of the rate of mycelial diffusion, the host either does or does not tolerate the infection. In the former case, symptoms are absent or inconspicuous before the smutted ears develop, the reaction of the plant being normal or 'normergical' and the relation between plant and parasite 'eusymbiotic', to adopt Gäumann's terminology [ibid., xxv, pp. 76, 173]. In the latter event the infected plants react strongly, showing symptoms of stunting and distortion as early as the one- to three-leaf stage, at which juncture many plants die. Those recovering remain short but produce healthy ears. Here the reduction is abnormal or 'hyperergical' and the relation between host and pathogen is termed 'parabiosis' [loc. cit.]. The plants are hypersensitive [ibid., xxv, p. 160] and, since they show no smut, field-resistant. The phenomena under discussion may be summed up in the following paradox: immature plants of normal, healthy appearance ultimately give rise to smutted ears, whereas young plants of abnormal, severely diseased aspect, if they survive, produce sound ones.

In the third factor-complex, only small areas of the spikelets of the ear are transformed into smut spores (e.g., stripes on the glumes), the major part retaining a normal healthy appearance. Ear-resistance of this type is often readily recognizable and may be used in the differentiation of physiologic races.

For the differentiation of physiologic races of *U. tritici*, 28 spring wheat varieties were inoculated with ten collections over the five-year period from 1940 to 1944, inclusive. The wheats fell into nine groups, within which nine varieties are recommended for use in the identification of the six physiologic races segregated from the collections, viz., Mindum, Renfrew, Florence × Aurore, Peragis 368/20, von Rümkers Dickkopf (replaceable by Picardie), Little Club, Thew (replaceable by van Hoek), Bersée (replaceable by Carma), and Vilmorin 29. Mindum was resistant to all six races. Renfrew was hypersensitive and field-resistant to race 6 (of German origin) and resistant to all the others. Florence × Aurore was also hypersensitive and field-resistant to race 6, normally susceptible to 5 (from Australia), and resistant to the others. Peragis 368/20 was susceptible to 5 and 6 and resistant to 1 (prevalent on Juliana and van Hoek and presumably the most widespread race in

Holland), 2 (from material of French and German origin tested for several years in Holland), 3 (from imported German winter wheat), and 4 (from Australian and Canadian seed). Von Rümkers Dickkopf was hypersensitive and field-resistant to 1 and 3, susceptible to 2, and ear-resistant to 4, 5, and 6, and Little Club hypersensitive and field-resistant to 1, 3, and 6, and susceptible to 2, 4, and 5. Thew was hypersensitive and field-resistant to race 6 and susceptible to all the others, while Busée and Vilmorin were both resistant to 1, 2, 5, and 6, the former being susceptible to 3 and 4 and the latter hypersensitive and field-resistant to 3 and susceptible to 4. Of the three winter wheats included in the differentiation tests, Jubilé was resistant to all six races, Juliana (Vilmorin 27) susceptible to all, and Astra resistant to 1, 2, 5, and 6, and susceptible to 3 and 4. Winter varieties are, however, less suitable for differential purposes than summer ones owing to the liability of interference by frost.

Two experiments were carried out to ascertain the influence on pathogenicity of a mixture of physiologic races. In the first, Little Club was simultaneously inoculated with a mixture of 4 and 6 in different proportions, the former race inducing a normally susceptible and the latter a hypersensitive reaction. The following percentages of hypersensitiveness were recorded: for 1 part (i.e., 1 gm. spores per l. water) of 6, 92; 1 of 6 and 1 in 1,000 of 4, 92; 1 and 1 in 100, respectively, 83; 1 and 1 in 10, 63; 1 and 1, 39; 1 in 10 and 1, 22; 1 in 100 and 1, 4; and 1 in 1,000 and 1, 6. The data relating to normal susceptibility were lost during the evacuation of Wageningen, but the writer believes this type of infection to have exceeded the hypersensitive by 10 to 20 per cent. In the second test eight varieties were inoculated with a mixture of equal parts of races 1, 4, 5, and 6, resulting in heavy reductions in the incidence of loose smut, notably in the cases of Florence × Aurore, Peragis 368/20, and Ceres.

Cheo (C. C.). **A note on the relation of nematodes (Tylenchus tritici) to the development of the bacterial disease of Wheat caused by Bacterium tritici.**—*Ann. appl. Biol.*, xxxiii, 4, pp. 446–449, 4 figs., 1946.

The wheat disease caused by *Bacterium* [*Pseudomonas*] *tritici* [*R.A.M.*, xiv, p. 571] has so far been found in China only in Hopei and Kweichow, where the disease due to the nematode *Tylenchus* [*Anguillulina*] *tritici* [loc. cit.] is also present. In 1936 field and pot experiments were carried out at Peiping to determine the part played by the nematode in the development of the bacterial disease. Susceptible wheat seeds were sown in field plots and in pots and (1) inoculated with material from galls containing bacteria associated with nematodes, (2) inoculated with the powdered bacterial mass from diseased specimens, (3) inoculated with nematode galls and the powdered bacterial mass, and (4) not inoculated. In May, 1937, all the controls were healthy, no disease developed in set (2), only a few heads covered with yellow exudations as well as numerous heads with nematode galls were produced in those inoculated with nematode galls alone, while a large number of diseased heads, but few with nematode galls, were produced when both bacteria and nematode galls had been used.

The work was resumed in 1940, when pot inoculations were again made, the treatments being (1) uninoculated, (2) inoculation with a pure culture of bacteria, (3) inoculation with galls containing bacteria and nematodes, and (4) inoculation with galls containing bacteria plus nematodes and a pure bacterial culture. The results obtained in this and the next experiment clearly demonstrated that the bacterial disease resulted only when the galls were used as inocula. The same procedure accompanied by soil sterilization showed that the latter had no definite effect on the nematode disease while it slightly increased the bacterial. Surface sterilization of galls had no effect on the subsequent infection induced by them suggesting that the bacteria are carried mainly within the galls. The bacteria

associated with the galls were still alive after 2½ years' dormancy. Examination of the growing points and developing spikes of nematode-infested plants showed that tissues with nematodes may contain no bacteria, but those with bacteria all contained nematodes. In the leaf, only bacteria were observed. Data from 320 plants in pot tests showed that the bacterial disease is more damaging than the nematode disease, over 50 per cent. of the bacteria-infected culms failing to head.

Vallega (J.) & Favret (E. A.). **Herencia de la resistencia a 'Erysiphe graminis hordei' en Cebada. 1. Factores de resistencia en las variedades Monte Cristo y Nigrate.** [Heredity of resistance to *Erysiphe graminis hordei* in Barley. 1. Factors of resistance in the Monte Cristo and Nigrate varieties.]—*Rev. Invest. agric., B. Aires*, i, 2, pp. 81–91, 1947.

The progeny of the F_1, F_2, and F_3 generations of crosses between the Monte Cristo and Trebi, Nigrate and Trebi, and Nigrate and Monte Cristo barley varieties were analysed for their reactions to *Erysiphe graminis hordei* Arg. 1 [*R.A.M.*, xxvi, p. 151]. Monte Cristo is immune from the pathogen, and this character is inherited as a simple dominant factor for which the designation Oi^{me} is proposed. Nigrate is resistant, but its reaction varies with environmental conditions, notably temperature and light. The character for resistance is transmitted as a simple recessive factor, or ^{n}. The variety evidently harbours a recessive factor for the intensification of resistance, together with multiple modifying genes. Trebi is very susceptible to the single physiologic race of *E. g. hordei* hitherto identified in Argentina; it is, however, a useful fodder variety, and the possibility is being studied, parallel with the genetical analyses, of incorporating resistance into it.

Goodman (J. J.) & Henry (A. W.). **Action of subtilin in reducing infection by a seed-borne pathogen.**—*Science*, cv, 2725, pp. 320–321, 1947.

In studying the effects of subtilin, an antibiotic substance produced by *Bacillus subtilis*, on *Xanthomonas translucens* and on the disease which it produces in barley [*R.A.M.*, xxv, p. 553], the authors infected barley seed with the pathogen and treated it with subtilin simultaneously by making up the inoculum with dilutions of subtilin in distilled water. Germination tests showed that *X. translucens* exposed to a 1 to 1,000 dilution of subtilin was largely inactivated as measured by its ability to cause infection in barley seedlings (0·8 per cent. infection in sterilized soil and 0 in unsterilized, whereas a dilution of 1 : 5,000 allowed 41·9 and 25·4 per cent. infection, respectively). Subtilin also reduced infection when applied four to five days after the seed had been infested with the pathogen.

McKay (R.). **A study of Septoria oxyspora Penz. & Sacc. isolated from diseased Barley.**—*Sci. Proc. R. Dublin Soc.*, N.S., xxiv, 6–11, pp. 99–110, 3 pl., 1946.

A full account is given of the author's study of a fungus causing a disease of barley first observed in Ireland in 1931 and reported as a species of *Septoria*. The disease was not observed again until 1945, when it was found in association with *Rhynchosporium secalis* on barley in County Cork and has been identified as a strain of *Septoria oxyspora* [*Lunospora oxyspora*: *R.A.M.*, xxv, p. 157].

The original attack occurred on a strain of Spratt-Archer barley, introduced by the Plant Breeding Division, Albert Agricultural College, Glasnevin in 1931 and appeared as a dark brown spotting of the foliage on the tips of several plants about the middle of June of that year. By the 1st July the disease had spread so extensively that it was obvious from a distance of 20 yards, every plant in the plot being affected. The top leaves of the plants first affected were yellow for one to five inches at the tips, so that for an area of several square yards the ends of the upper foliage appeared as if scorched by fire. Both the yellow patches and the green tissue bore numerous small spots with a greyish centre surrounded by a purplish border.

The yellow patches and grey centres were studded with numerous black pycnidia. Very small spots were entirely brown or dark purple. The spots ranged from 1 to 3 mm. in length, and were mostly elongated in the direction of the leaf. The flag leaf was that most severely affected, often showing only a narrow band of green tissue, from the base half-way up the lamina, all the rest being chlorotic and virtually dead. Diseased spots on the lower leaves were chiefly on the tips and margins. It was evident that the death of the foliage was mainly due to the coalescing spots, narrow strips 2 to 3 cm. long being killed outright. The auricles and bases were not attacked until the rest of the leaf was all but dead. No trace of the condition was found on any of the adjacent plots, comprising 15 foreign barley varieties, as well as native varieties and hybrids. The affected barley was cut and destroyed on 2nd July; the disease recurred on the young foliage sprouting from the base in July and September.

On fresh material the pycnidia were slightly flattened at the top, had the greatest diameter parallel to the vascular bundles, and measured 76 to 119 by 72 to 78μ; the breadth, averaging 77 μ, was more constant than the length. The thin-walled, hyaline, typically more or less crescent-shaped pycnospores were slightly blunt at the keel, bluntly pointed at the apex, and measured 15 to 22 by 2 to 4 (average 18 by 3) μ. In nutrient solutions they reached 30 (average 24) by 4 μ. Inoculations of barley plants in the greenhouse and the fields gave positive results.

In pure culture on various media conidial development was often accompanied by the formation of sclerotia, in which respect the fungus appears to differ from any known *Septoria* so far cultured from small cereals or grasses.

The disease on barley is regarded as having no economic importance at present in Ireland.

Robertson (D. W.), Wiebe (G. A.), & Shands (R. G.). **A summary of linkage studies in Barley : supplement I, 1940–1946.**—*J. Amer. Soc. Agron.*, xxxix, 6, pp. 464–473, 1947.

Since the publication of a summary of linkage studies in barley (*J. Amer. Soc. Agron.*, xxxiii, pp. 47–64, 1941), several additional factor pairs have been studied and a number of contributions made to the knowledge of linkage relations in barley chromosomes. The present paper comprises tables showing (1) genetic factors studied between 1940 and 1946, showing the characters, symbols recommended, previous symbol used, and authority, (2) symbols allotted to characters in unpublished studies from 1940 to 1946, (3) linkage and association reported in studies of barley genetics from 1940 to 1946 (symbols, percentage recombination, and authority), (4) factor pairs showing independent inheritance as reported by workers on barley genetics from 1940 to 1946 (symbols and authority), and (5) two polysomics and polyploids. Among the characters being investigated from the linkage standpoint is resistance versus susceptibility to *Helminthosporium gramineum* [*R.A.M.*, xxv, p. 107], *Ustilago nuda*, *Puccinia graminis* [ibid., xxv, p. 552], mildew [*Erysiphe graminis*: ibid., xxiv, p. 224], and (unpublished) *P. anomala*, *Fusarium* scab [*Gibberella zeae*], and *U. hordei*.

Ullstrup (A. J.) & Brunson (A. M.). **Linkage relationship of a gene in Corn determining susceptibility to a Helminthosporium leaf spot.**—*J. Amer. Soc. Agron.*, xxxix, 7, pp. 606–609, 1947.

Susceptibility in maize to the leaf spot caused by *Helminthosporium carbonum* [*R.A.M.*, xxiii, p. 293] having been shown to be inherited as a monogenic recessive and the symbols *Hm hm* assigned to the genic pair, studies were carried out at the Purdue University Agricultural Experiment Station, Lafayette, Indiana, to determine the linkage relationships involved. Crosses were made between a series of translocation stocks, in which sugary endosperm was used as an indicator for the

chromosomal exchange, and two inbred lines of yellow dent, Pr and K61, homozygous for susceptibility to the pathogen. The F_1 progeny of the several crosses were back-crossed with pollen from double recessives (sugary, susceptible), and the resultant offspring were inoculated at the three- to four-leaf stage with spore suspensions of *H. carbonum* race 1, and the homozygous-susceptible line Pr with red cobs was selected and crossed with a resistant, brachytic, fine stripe-1 linkage tester stock with white cobs. Multiple recessives—white cob, susceptible, brachytic, and fine stripe—in the F_2 were selfed and crossed with red-cob, resistant, normal stocks. The F_1 of the latter cross were back-crossed with multiple recessives and the resultant progenies planted in the field and inoculated with *H. carbonum*.

The tabulated results show a highly significant divergence from an expected 1 : 1 : 1 : 1 back-cross ratio in the progenies involving interchanges between chromosomes 1 and 4, whereas in all others the deviations from the ratio anticipated in independent inheritance were non-significant. Hence it is concluded that the gene, *hm*, conditioning the inheritance of susceptibility to infection by the leaf spot is located on chromosome 1, 32·8 units to the right of the *P* locus and 14·3 to the left of *br*. From the relative frequency of double cross-overs the order of the genes was determined as $P—hm—br—f_1$.

In this test the severity of disease reaction was appreciably less than is found on susceptible inbred lines, though of sufficient intensity for easy differentiation between resistant and susceptible segregates. The reason for the low level of virulence is unknown.

Minz (G.). **Diplodia natalensis, its occurrence on flowers, button and stem-end of Shamouti Orange, and its relation to stem-end rot and fruit drop.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 152–168, 1 graph, 1946. [Hebrew summary.]

Diplodia natalensis was detected on or in the stem-ends of Shamouti oranges at Rehovoth, Palestine [*R.A.M.*, xxiv, p. 189] a fortnight after fruit set in May, its incidence, however, being lower from then until October than from November, when the fruits attained their full size, until the picking season in April. 'Latent *Diplodia*', here connoting the occurrence of the fungus on or in the tissues after surface sterilization, was found to be most prevalent during March and April, when it was concentrated mainly on the base of the fruit. In its latent form the pathogen was not more abundant on diseased sepals than on healthy ones, but the incidence of 'total *Diplodia*' (comprising isolations from fruits without previous disinfection of the surface) was higher on the former than on the latter and on the stem-ends of fruits with diseased sepals. The fungus attacked the stem-ends of fruits from old groves more extensively than those from young ones, but the amounts of infection on pruned and unpruned trees did not differ appreciably. *D. natalensis* was seldom found in the flowers, on which it is of little or no importance. The stem-end rot is caused by the spores in the stem-end region, which germinate as the season advances and penetrate the fruits by way of the basal tissues.

In these investigations *Colletotrichum gloeosporioides* and *Alternaria* sp. were mainly responsible for the desiccation of sepals or their margins in February and March, though *D. natalensis* was sometimes observed. All three organisms, moreover, are suspected to be concerned in the premature yellowing and dropping of normal-sized fruits.

Presley (J. T.). **Thielaviopsis root rot of Cotton in Mississippi.**—*Plant Dis. Reptr*, xxxi, 4, p. 152, 1947. [Mimeographed.]

In the spring of 1945 and 1946 root rot due to *Thielaviopsis basicola* [*R.A.M.*, xxii, p. 21] caused considerable loss of cotton seedlings, especially on the heavier soils in the northern part of Mississippi and in the Delta. The fungus was found in 30 per cent. of the diseased seedlings in certain fields. The first mature plants

killed by internal collar rot caused by the fungus were observed in 1946. This rot results from seedling lesions, only partially healed, which become active again in early autumn. In Oktibbeha County more than 20 per cent. of the plants were killed in a localized area.

Arndt (C. H.), Blank (L. M.), Lehman (S. G.), Neal (D. C.), Presley (J. T.), Ray (W. W.), Rogers (C. H.), Simpson (D. M.), Smith (A. L.), & Young (V. H.). **Summary of co-operative tests of Cotton seed treatments—1946.**—*Plant Dis. Reptr*, xxxi, 5, pp. 204–210, 1947. [Mimeographed.]

In 1946, cotton seed treatments [*R.A.M.*, xxv, p. 369; xxvi, p. 152] were compared in two tests in 14 plantings in nine of the United States. In the first Du Pont 1452F (ethyl mercury *p*-toluene sulphoanilide) and Dow—9B (zinc 2-4-5 trichlorophenate) were compared at a rate of 3 gm. per kg. (1·5 oz. per bush.) on fuzzy, fuzzy-matted, lightly reginned, lightly reginned-matted, heavily reginned, and acid-delinted seed. In the second, seven treatments were compared on Stoneville 2B cotton seed well infested by the anthracnose fungus [*Glomerella gossypii*]. In both tests Dow—9B and Du Pont 1452F were about equally effective, when the number of seedlings surviving until the final seedling count was used as a criterion of effectiveness. The highest percentage seedling stands were obtained with the delinted treated seed.

Some seed treated with dusts containing 20, 30, and 50 per cent. zinc trichlorophenate were compared in several plantings in North and South Carolina. The 50 per cent. dust tended to be slightly superior, while the 20 per cent. dust was greatly inferior in one planting.

The effectiveness of Du Pont 1452F and Dow—9B was not improved by the addition of fermate or zerlate. Preliminary tests indicated that neither of these dusts at dosages of 10 g. per kg. would destroy *G. gossypii* in the seed.

Progress Reports from Experiment Stations, season 1945–46.—132 pp., 1 graph, London, Empire Cotton Growing Corporation, 1947.

The following items of interest are presented in this report [cf. *R.A.M.*, xxvi, p. 243]. G. M. Wickens (pp. 20–31) recalls that *Verticillium* wilt of cotton [ibid., xxvi, p. 395] was first found at the Cotton Experiment Station, Barberton, South Africa, in the season 1938–39. By 1945 the disease had steadily become more prevalent, affecting some new fields and rendering them unfit for breeding work. All isolations showed in culture a *Verticillium* producing sparse aerial mycelium with dense black sclerotia and pustules of a readily separable hyaline saltant characterized by dense white aerial mycelium completely lacking sclerotia and which is only slightly pathogenic. The saltant occurs naturally only in association with its sclerotial parent. The causal organism, although herein provisionally designated *V. dahliae* owing to the sclerotial formations, should according to other workers be more properly named *V. albo-atrum*.

In wound inoculation experiments with *V. dahliae* and its hyaline saltant it was found that sclerotial strains proved more virulent to U. 4/5143 than the saltant. The normal incubation period of 19 to 40 days was shortened and the proportion of successful inoculations greater when plants were stripped of young bolls, flowers, and flower buds. There was a mean reduction in yield of about 50 per cent. as a result of infection. The course of disease in inoculated plants was the same as that observed in naturally infected plants and did not spread to neighbouring untreated plants. Greenhouse wound inoculations were made on the Uganda strain BP. 50 and on A. 2106 (U. 4×Cambodia). Plants inoculated with sclerotial strains showed symptoms in 22 days, were severely affected in expanded leaves in 26 days, and were shrivelled and dead by the 36th day. In an elaborate, detailed experiment in which the Uganda strain BP. 50 in cans was soil inoculated by four methods,

a 100 per cent. infection was produced by the addition of 40 gm. of 25 per cent. maize meal-sand inoculum per kg. of dry soil, well mixed. The shortest incubation period by this method was 57 days. When various plants were inoculated by the stem-wound method with hyaline and sclerotial strains, eggplant (var. Black Beauty) was susceptible to both strains, sunflower, tomato (var. Marglobe), and sunn hemp [*Crotalaria juncea*] were susceptible to the sclerotial strain only, while chillies were apparently immune from both. Field observations showed that of 5,299 U. 4/5143 plants set on 2nd January in a field adjacent to the original wilt-infested area, 633 had become infected by the end of August. No cotton had been grown there for five years, maize having taken its place.

The possibility of seed transmission of *V. dahliae* is supported by much circumstantial evidence, but attempts at demonstrating it are unconvincing. Therefore, seed from affected plants has been saved for future testing.

Although stainer (*Dysdercus nigrofasciatus*) population was heavy, internal boll disease (*Nematospora gossypii*) was quite light. Bacterial boll rot (*Xanthomonas malvacearum*) also caused little damage, most infection entering by the boll wall at the base, the remainder via the apical channel left by the incomplete fusion of the carpels, a common feature of U. 4 cotton. Bolls of U. 4/5143 were inoculated in the field with *N. gossypii* [ibid., xxvi, p. 28] by both stainer and needle injection, the latter producing a more severe infection which became progressively less severe, however, with increasing age of boll at the time of inoculation. *Alternaria* [? *macrospora*, ibid., xxvi, p. 14] was common on senescent leaves, a chromogenic, shyly sporing strain and a non-chromogenic, freely sporing strain both having been isolated from leaf spots of identical appearance.

Of the diseases affecting other crops, *Fusarium* wilt of sunn hemp caused appreciable damage to two fields. Death of a few trees in the *Cassia siamea* windbreaks was attributed to a ? *Ganoderma* sp.

G. S. Cameron (pp. 46–47) reports that in Southern Rhodesia the leaf symptoms of *Alternaria* were quite prevalent in the young crop during the over-abundant rainfall in January and February on crops which had not received compost.

S. H. Evelyn of the Gezira Station reports (pp. 51–59) that in leaf curl [cotton leaf curl virus] resistance tests, in the Anglo-Egyptian Sudan, progenies of resistant Domains Sakel and Masseys Domains Sakel both possess resistance genes and that selection is having a decided positive effect. There was hardly any difference between BAR. 1730L and X. 1730A [ibid., xxv, p. 500] as regards hair and spinning value. Resistant BAR. 4/5 was slightly more even and less neppy than X. 1730A and had a slight advantage in yarn appearance, but they were practically identical in strength and spinning quality. X. 1730A was slightly superior to resistant BAR. 4/11 in all major hair and spinning qualities.

At the Shambat station R. L. Knight (pp. 61–66) [ibid., xxvi, p. 200], in the production of blackarm-resistant Egyptian varieties, carried the resistance genes B_1, B_2, and B_3 to the fifth back-cross stage, seed of the sixth having been produced for 1946–47 sowing. A small area of ninth back-cross X. 1730, homozygous for both B_2 and B_3, was propagated as well as a small plot of B_1B_3 1730, grown as a stage in the synthesis of a type carrying all three resistance genes. Under conditions in which blackarm was excluded as far as possible, BAR. 1730L and X. 1730A were found to be almost equal in lint yield and spinning quality, although the seed came from Shambat (usually much inferior) and Gash, respectively. It is probable that BAR. 1730L will now be tried on a commercial scale and sown earlier than is possible with the present susceptible X. 1730A main crop.

From Uganda J. D. Jameson reports (p. 81) that *Alternaria* and associated fungi caused considerable damage to cotton between Entebbe and the Tanganyika border along the shore of lake Victoria where drought occurred on the very acid soil. Resting the soil under elephant grass [*Pennisetum purpureum*] probably alleviates the trouble.

P. E. Weatherley (pp. 85–86) reports that six blackarm-resistant selections from N. 17 and B. 181, and a bulk mixture of resistant selections from BP. 50R were compared with their parental types and other commercial varieties. The best resistant N. 17 derivative gave a lint yield of 79 lb. per acre above the average for the commercial N. 17 bulks. As in the previous year, both in seed and district trials, B. 181 and its derivatives gave the highest lint yield, the best being 237 lb. per acre, and they were the most markedly resistant. In spinning tests B. 181 gave the strongest yarns in one district, and seed is being increased.

According to J. E. Peat (pp. 97–98) reporting from the Lake Province of Tanganyika, *X. malvacearum* badly attacked stunted native cotton in the Ukiriguru area killing young plants and distorting poorly grown ones. Serious manifestations were also observed in the U. 4 Sea Island hybrid material and it is thought that two seasons of heavy early rains followed by drought may be responsible for both attacks. In other parts of the area where growing conditions were better the plants outgrew the attack.

H. C. Ducker reports from Nyasaland (p. 116) that circumstantial evidence suggests that boll shedding not due to boll worms [*Diparopsis castanea*] may be connected with susceptibility to blackarm. Although no proof has yet been found to substantiate the statement, blackarm seems to be less of a limiting factor in Nyasaland than it is in more northern countries.

Drechsler (C.). **A nematode-strangling Dactylella with broad quadriseptate conidia.**—*Mycologia*, xxxix, 1, pp. 5–20, 2 figs., 1947.

Continuing his researches on Hyphomycetes capturing nematodes [*R.A.M.*, xxv, pp. 341, 393; xxvi, p. 106], the author describes a new species occurring on decaying leaves of beech (*Fagus grandifolia*) and named by him *Dactylella coelobrocha* n.sp. The organism captures and consumes various nematodes, including *Plectus parvus*, *Rhabditis* spp., and *Wilsonema* sp.

Eglitis (M.). **Beitrag zur Mikroflora der Leinpflanzen von leinmüdem Boden.** [Contribution to the microflora of Flax plants from Flax-sick soil.]—*Contr. Balt. Univ. Pinneberg* 12, 14 pp., 1947. [English abstract.]

Thielavia [*Thielaviopsis*] *basicola* [*R.A.M.*, ix, p. 783], *Fusarium* spp., and *Colletotrichum lini* [*C. linicola*] were determined as the principal agents of flax root rot on 440 plants from flax-sick soil at Schönberg, Moravia (Czechoslovakia), followed by *Polyspora lini* [ibid., xxvi, p. 55] and *Stachybotrys alternans* [cf. ibid., xxi, p. 370; xxiv, p. 276]. The aerial organs of the plants were attacked chiefly by *C. linicola*, *F.* spp., *Alternaria tenuis*, and *Cladosporium herbarum* [ibid., xxiv, p. 451]. The parasitism of two of the foregoing species, namely, *S. alternans* and *A. tenuis*, is doubtful. Other fungi of minor importance included species of *Mucor*, *Phoma*, *Oospora*, *Cephalosporium*, *Penicillium*, *Acremoniella*, *Trichothecium roseum*, and *Cladosporium epiphyllum*.

Some of the 49 varieties and selections represented in the investigation, e.g., Eckendorfer Früh, Roland, and Meschenmok, were infected by only two or three pathogens, whereas 12 were found on Buda. However, the experimental area was too small, and the number of observations too few, for definite conclusions as to varietal reaction to be drawn.

Eglitis (M.). **Ergebnisse der Resistenzprüfung des Leins für Colletotrichum lini Manns et Bolley. I. Bericht.** [Results of the testing of Flax for resistance to *Colletotrichum lini* Manns & Bolley. First report.]—*Contr. Balt. Univ. Pinneberg* 30, 16 pp., 1947. [English summary.]

The following method was devised in 1945 at the former Kaiser Wilhelm Institute for Bast Fibre Research (now Výzkumný ústav Lnářský v Temenici u Šumperka),

Schönberg, Moravia (Czechoslovakia), for the testing of flax samples for resistance to *Colletotrichum lini* [*C. linicola*: see preceding abstract]. Conidial suspensions of an aggressive German isolate of the fungus from the Roland variety, grown on carrot juice agar, were inoculated between 16th February and 27th September into 6- to 11-day-old seedlings in clay dishes filled with loamy compost (120 seeds per dish) in the greenhouse. The dishes were covered with bell jars from sowing until the emergence of the seedlings and again for four days after inoculation, during which period the inner walls were sprinkled with water to maintain the necessary high degree of atmospheric humidity.

Of the 203,116 seedlings produced by 2,621 samples, 1,641 (0·8 per cent.) from 269 samples were resistant, mostly winter flax from the Mediterranean region, together with some hybrids bred at the Institute. In 57·4 per cent. of the plants both stems and cotyledons were attacked, while in the remaining 42·6 the former were healthy. Should this relationship be maintained after further testing it may find practical application in flax-breeding.

McCulloch (Lucia). **Notes on a brown pigment and other unusual characters in cultures of Bacterium marginatum.**—*Phytopathology*, xxxvii, 5, pp. 349–353, 2 figs., 1947.

On Thaxter's potato agar at pH 5 to 5·5, *Bacterium marginatum* [the agent of scab and neck rot of *Gladiolus*: *R.A.M.*, iv, p. 287, *et passim*] produces consistently, in addition to the usual rather featureless cells, numerous evanescent, hyaline spheres, mostly mere dots in size though many are 4 to 7 or up to 20 μ in diameter, which are succeeded by fewer but larger, permanent brown spheres, predominantly 0·5 to 0·8 μ but frequently measuring 5 to 25, occasionally 40 to 45, and in one instance 60 μ. Unlike the readily staining hyaline spheres, the brown ones are extremely resistant to the many chemical reagents tested. With age, if the medium remains moist, the brown spheres, especially the larger specimens, develop a hyaline wall, which usually breaks away from the brown centre and may finally undergo further disintegration into the small, hyaline, ephemeral type. Brown bacteria, frequently of abnormal size and shape, also occur on the same substratum.

Embedded in the cleared agar below the bacterial growth are numerous sphaerocrystals, 5 to 35 μ in diameter, composed of radiating, acicular parts. Since they are formed only in starch-containing media (*J. agric. Res.*, xxxix, pp. 495–501, 1929) and stain blue with iodine, it is thought that they may represent some form of starch. Mobile mycelioid forms, 2 to 200 μ in length, develop profusely in 2 to 3 per cent. dextrose or galactose solutions and occasionally on potato agar.

Davidson (R. W.) & Mielke (J. L.). **Fomes robustus, a heart-rot fungus on Cacti and other desert plants.**—*Mycologia*, xxxix, 2, pp. 210–217, 3 figs., 1947.

Wood-decaying Hymenomycetes have not previously been reported as causing decay of the woody skeleton in living cacti. Specimens of a *Fomes* found at the base of the arms of living giant cacti (*Cereus giganteus*) and at the base of injured main stems and on other cacti and desert shrubs in Arizona in 1941 were received for identification at the Division of Forest Pathology, United States Department of Agriculture. A comparison of pure cultures from fresh sporophores of the *Fomes* on cacti with cultures of other *F.* spp. showed that they resembled most closely cultures of *F. robustus* from oaks [*R.A.M.*, xxi, pp. 56, 396]. The fungus is considered to be that species although the sporophores of the cactus *Fomes* were smaller and more rimose than typical ones of *F. robustus*. On *Cereus* the fungus is most commonly found on hard, bark-like outer tissues. The broken-off basal ribs were badly rotted. On *Opuntia* spp. the sporophores develop near ground-level at branch

stubs or woody areas exposed by injury. Decay extends upwards, occasionally to a height of 4 ft. or more. The rotting of the woody skeleton near the base causes the plants to fall over.

Faull (J. H.). **Tropical Fern hosts of rust fungi.**—*J. Arnold Arbor.*, xxviii, 3, pp. 309–319, 1947.

Lists are given in tabular form of the published tropical fern hosts, their rusts, and location, together with new records for tropical fern hosts of rust fungi found in South America and the neighbouring island groups.

Volcani (Temira). **Powdery mildew on the leaves of Dodonaea viscosa Linn.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 181–185, 1 fig., 1946. [Hebrew summary.]

The agent of a powdery mildew of *Dodonaea viscosa* leaves, observed for the first time in Palestine in 1945, is described as a new species under the name of *Oidium dodonaeae* I. Reichert & T. Volcani. The pathogenicity was proved by inoculation.

Nattrass (R. M.). **A disease of Pyrethrum in Kenya.**—*Nature, Lond.*, clx, 4056, pp. 120–121, 1 fig., 1947.

Pyrethrum (*Chrysanthemum cinerariifolium*), grown in Kenya for commercial purposes, showed no serious disease until June, 1946, when on the Mau Escarpment, one of the most productive areas, a serious decrease in yield was observed, estimated in some instances to be as high as 80 per cent. Although the plants themselves looked healthy, the flower buds failed to develop because of an attack of *Ramularia bellunensis* [*R.A.M.*, xvii, p. 584]. The disease rarely extended below the apical inch or so of flower stalk and seldom spread to the foliage. If it did, no definite spots were formed on the leaves, but the infection started from the tip of the segments and extended inwards. The conidiophores were abundantly developed on the inner surfaces of the involucral scales, fragments of which were easily distributed with the seed.

By the end of 1946 the disease had spread to all the chief pyrethrum areas with the exception of the Nyeri–Nanyuki region on the slopes of Mount Kenya which, up to April, 1947, had remained free. It appears that this is the first record of the pathogen on *C. cinerariifolium*.

Sykes (S. M.). **Mould wastage in the storage and transport of fruit.**—*Agric. Gaz. N.S.W.*, lviii, 4, pp. 201–204, 1947.

A brief, popular account is given of the factors conducive to mould wastage during the storage and transport of fruit (i.e., pre-harvest factors and those related to picking, handling, grading, packing, and storage) in New South Wales and of the means by which the losses sustained may be minimized.

Hutton (K. E.). **Bitter pit of pome fruits.**—*Agric. Gaz. N.S.W.*, lviii, 4, pp. 205–208, 6 figs., 1947.

In New South Wales apple varieties of commercial importance which are susceptible to bitter pit [*R.A.M.*, xxii, p. 488; xxiv, p. 92] are Granny Smith, Delicious, Jonathan, Democrat, Rome Beauty, McIntosh Red, Crofton, Dougherty, and Stayman Winesap.

In the 'tree pit' form of the disorder every fruit may be affected, or only a few or all the fruits on a single branch. Early pickings are not likely to show tree pit until reaching the market, as the external symptoms may be slight at picking; in later pickings the symptoms are immediately apparent.

If fruit which would later develop pit on the tree is placed in storage, the 'storage pit' condition will develop as ripening proceeds. On the other hand, fruit which would not have pitted on the tree should not pit in store, provided picking takes place when the fruit has reached proper storage maturity. The chief cause of the development of storage pit appears to be picking while the fruit is relatively immature. The safe-picking maturity stage varies, particularly with light crops of susceptible varieties, and its recognition depends on experience. It is, however, essential that the picking date should be decided on the basis of maturity and not on size alone. Bitter pit in overseas shipments can be much reduced by later picking and prompt removal to cool storage.

Additional control methods include light pruning (aiming, in the case of susceptible varieties, at securing a regular, evenly distributed crop), proper drainage, suppression of excessive weed growth during dry periods, avoidance of manuring during the growing period and of irrigation when the fruit nears maturity, and delaying picking of susceptible varieties so that tree pit will have time to show and the affected fruits can be discarded.

Howard (F. L.). **Organic mercury fungicides as foliage sprays.**—Reprinted from *Agric. Chemicals, 1946*, 4 pp., 5 figs., 1946.

During 1942 a preliminary field trial carried out in Rhode Island on the use of organic mercury salts (phenylmercuri triethanol ammonium lactate and related derivatives) against apple scab [*Venturia inaequalis*] proved highly successful. Subsequent laboratory studies indicated that the concentrations giving L.D. 50 and L.D. 90 values for spore germination of *Macrosporium* [*Stemphylium*] *sarciniforme* [*R.A.M.*, xxii, pp. 101, 145] and *Sclerotinia fructicola* were 1 p.p.m. and 3 p.p.m., respectively, in water. As the formula was improved the toxic concentrations were reduced to 1 and 0·5 in 10,000,000, respectively. It was considered that a practical concentration against plant pathogens would lie somewhere between 50 and 200 p.p.m.

Phytotoxicity studies showed that a concentration of 1 : 10,000 was not noticeably injurious to apple foliage, while controlling *V. inaequalis*; in some cases a concentration of 1 : 80,000 was able to prevent apple scab.

The tenacity of the water-soluble organic mercury fungicides was such that in laboratory tests 120 washings reduced the fungitoxicity of the residue on glass slides by less than 10 per cent.

Laboratory tests also demonstrated that up to 200 p.p.m. of calcium salts could be added to a 1 : 16,000 solution of phenylmercuri triethanol ammonium lactate without any significant decrease in fungitoxicity. Both laboratory and field tests showed that when organic mercury compounds were combined with DDT neither seemed to decrease the fungicidal or insecticidal value of the other. In combination with summer spray oils they showed no reduction in disease-control power.

In four years' trials no injury or discomfort resulted to the men engaged in spraying.

Chemical analyses of apples after being sprayed with the organic mercury compound gave conflicting data on the amount of mercury residue. Pending more information on the possibly poisonous nature of the residue, the use of organic mercurials should be confined to applications up to the first cover spray.

English (H.), Ryall (A. L.), & Smith (E.). **Blue mold decay of Delicious Apples in relation to handling practices.**—*Circ. U.S. Dep. Agric.* 751, 20 pp., 2 figs., 1 graph, 1946.

Studies conducted from 1938 to 1943 in Washington, D.C., to ascertain the effect of various handling practices on the development of blue mould (*Penicillium*

expansum) [*R.A.M.*, xxiv, p. 22] in Delicious apples from the upper Yakima Valley, showed that more open lenticels and greater amounts of lenticel and washing-injury decay occurred on fruit washed in sodium silicate (80 lb. to 100 gals. water) at 110° F. followed by 1·5 per cent. hydrochloric acid at 100° than on unwashed when both were dipped in a spore suspension of the fungus before packing. On the other hand, unwashed fruit similarly inoculated developed more lenticel infection than comparable washed fruits packed without artificial inoculation. Evidently, therefore, unwashed fruit with a high natural spore population might develop more decay than fruit washed under sanitary conditions and rinsed in clean water, even though the washed fruit may be more susceptible to decay. Severe washing, however, increases both the number of open lenticels and the proportion of lenticel infection.

Three days' delay in a non-refrigerated warehouse decreased susceptibility to washing injury and blue mould. While this delay is not recommended as a practice, it is pointed out that increased decay and washing injury might develop if immediate washing and packing were adopted in the absence of concurrent precautions to reduce the spore population and the severity of the washing.

No evidence was obtained that storage for some weeks at 32° before washing and packing makes the fruit more susceptible to washing injury and decay than those washed immediately. On the contrary, cold storage for two to ten weeks before washing resulted in increased resistance to washing injury in proportion, usually, to the length of storage. Six weeks' cold storage before washing resulted in the greatest resistance to infection. Whether the fruit was wet or dry when packed had no effect on infection.

When apples were passed through a washing solution heavily contaminated with *P. expansum* spores and then rinsed in relatively clean water only a slight increase in decay resulted; on the other hand, when unwashed fruit was subjected to a special rinse with a high spore population, infection was considerably increased. A thorough final rinse in clean water is considered important in the control of blue mould decay.

Susceptibility to *P. expansum* varied in fruit from different orchards and in that from the same orchard in successive seasons.

The importance of careful handling in the control of blue mould is indicated by the fact that many lenticel infections were found in bruised areas.

Isolations from lenticel infections which appeared different from those caused by blue mould yielded *Phialophora malorum* in all but one instance, in which an unidentified *Penicillium* was obtained. Fungi from lesions at other infection sites included (in descending order of frequency) *P. expansum*, *Botrytis cinerea*, *Phialophora malorum*, *Hormodendrum cladosporioides*, *Alternaria* sp., and *Neofabraea perennans* [ibid., xxv, p. 170].

Heim (R.). **Notes de phytopathologie africaine. 1. La pourriture de la hampe du Bananier en Guinée française.** [Notes on African phytopathology. 1. Main-stalk rot of Banana in French Guinea.]—*Rev. Mycologie, Suppl. colon.*, xi, 1, pp. 20–28, 1946.

This article forms the first of a series embodying the results of studies on banana diseases in French West Africa and is concerned with main-stalk rot, the principal agents of which are *Thielaviopsis* [*Ceratostomella*] *paradoxa* and *Gloeosporium musarum* [*R.A.M.*, xvi, p. 394; xix, p. 551, *et passim*]. The rot affects bananas in central America, the Antilles, Brazil, Colombia, India, and during recent years in the Canary Islands and West Africa. In 1940 the reception of four specimens with typical main-stalk rot from a consignment arriving at Bordeaux from Konakry, French Guinea, provided material for the completion of the West African studies. Isolates from the four specimens included the pathogenic species *C. paradoxa*, *G. musarum*, *Mucor mucedo* [ibid., xii, p. 39], and *Oidium* [*Oospora*] *lactis* f. *musarum*

[loc. cit.], and the saprophytes *Penicillium crustaceum* [loc. cit.], *Spicaria carnea*, and *Bacterium* [*Xanthomonas*] *solanacearum* [ibid., xxv, p. 267]. The methods of infection of these organisms were studied, two outstanding points emerging, that (*a*) fruit was infected only after the harvest and during transport, and (*b*) the organisms entered via wounds or open places on the stems. It is possible that *G. musarum* can live within the fruit for several weeks before any symptoms become apparent. From studies of the temperatures best suited to the development of the two major fungi [loc. cit.] and of transport conditions in relation to infection it was found that high temperatures (24° to 30° C.) favoured growth. No more than 36 hours should pass between picking and loading for transport, and the average temperature of 11° to 12° should be reached and maintained in the storage chambers within 48 hours of the loading. The sealing of stem ends and wounded surfaces has been found useful as a preventive against the disease [ibid., ix, p. 729]. Paraffin wax and paraffin oil have given the best results for this purpose and powdered or crystalline boric acid and 10 per cent. colloidal sulphur were useful as fungicides. If initial infection occurs before loading, the stems will become diseased if the voyage lasts longer than 12 days. Special emphasis is placed on the fact that correct transport conditions can do much to prevent the disease.

Sakimura (K.). **Thrips in relation to gall-forming and plant disease transmission : a review.**—*Proc. Hawaii. ent. Soc.*, xiii, 1, pp. 59–94, 1947.

Studies in the field of plant-disease transmission by thrips have been actively pursued of recent years, and numerous references are now available to supplement the reviews of the subject by Bailey (*J. econ. Ent.*, xxviii, pp. 856–863, 1935) and the author (*Proc. Hawaii. ent. Soc.*, ix, pp. 415–427, 1937). The section on plant disease transmission (pp. 63–86) is concerned with toxaemias, bacterial and fungous diseases, and viruses. The [tomato] spotted wilt virus is the only plant virus disease authentically demonstrated to be transmissible by thrips, and in this connexion the problem of its vectors in relation to the Hawaiian pineapple industry is briefly discussed [cf. ibid., xvii, p. 828; xxv, p. 567].

Elazari-Volcani (Zaphrira). **Bacterial rot of Avocado fruit.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 169–180, 1 pl., 1946. [Hebrew summary.]

A bacterial rot of an unripe Guatemalan Seedling avocado fruit was observed for the first time in Palestine in March, 1946. It was dry, hard, greenish, and spread from the distal end over about a third of one side. The infection penetrated deeply into the parenchyma, causing marked hardening and a dark discoloration of the tissues. The darkening extended to the vessels, though these were not actually invaded and only an occasional cell of the surrounding xylem contained bacteria. The typical symptoms of the rot were reproduced in the two winter varieties, Guatemalan Seedling and Nabal, pricked and inoculated at the distal end, but no infection resulted in fruits similarly treated at the stem or in uninjured ones inoculated at either site. The Ganther summer variety reacted similarly to inoculation at the distal end except that the fruits softened after five days instead of 18, as in Guatemalan Seedling. The organism isolated from the infected tissues and grown on nutrient agar at 25° C. corresponded in the main with *Pseudomonas syringae*. The colonies of the avocado bacterium, however, are creamy-white instead of greyish-white with a blue tinge, while another differential feature is the absence on the infected fruits of the prominent, cracked crust described by W. T. Horne as typical of *P. syringae* on avocado in California [*R.A.M.*, xiv, p. 707]. The Palestine avocado bacterium, presumably representing a local variant of *P. syringae*, was inoculated into Shamouti oranges and Eureka lemons, on which it induced the characteristic symptoms of black pit, and was reisolated from the diseased tissues.

Adsuar (J.). **Studies on virus diseases of Papaya (Carica papaya) in Puerto Rico. I. Transmission of Papaya mosaic. II. Transmission of Papaya mosaic by the green Citrus Aphid (Aphis spiraecola Patch). III. Property studies of Papaya mosaic virus.**—*Tech. Pap. P. R. agric. Exp. Sta.* 1, 2, 4, 26 pp., 6 figs., 1946.

During a reinvestigation of papaw mosaic in Puerto Rico, three diseases, presumably caused by virus infection, were identified. The bunchy top disease [*R.A.M.*, xxv, p. 305; xxvi, p. 402] is the most common; it was first reported from the island in 1931 and assumed epidemic proportions during 1937 and 1938. It involves stunting, failure of latex flow, and slow growth of short, stiff, horizontal petioles. The leaves are small, thick, and chlorotic. A less prevalent type, sometimes called die-back, shows severe chlorosis and defoliation from below the growing point, progressing downwards and usually followed by necrosis of the tip of the stem or the whole plant. A typical mosaic disease replaced these two types in a small area including Guanica and Ponce. It is characterized by stunting, oily spots on the stem and petioles, extreme foliar distortion and mottling, uninterrupted latex flow, and by green and brown rings on the fruits. All three types show a marked reduction of top growth and sudden appearance of green streaks on the stem and young petioles. Bunchy top and die-back are almost always characterized by failure of latex flow, whereas the mosaic type seldom shows this.

In transmission experiments with the papaw mosaic, healthy papaw plants 1½ to 3 months old, grown in 6-in. pots in the greenhouse, were used. Eleven out of 29 plants were infected by the pin-puncture method and 23 out of 28 by the use of carborundum. The disease was also transmitted by grafting. Typical field symptoms developed, but with more severe atrophy and leaf distortion.

The papaw mosaic diseases reported from other countries [ibid., xviii, p. 808], although having some features in common with the Puerto Rico disease, do not show the characteristic mottling and extreme distortion of the leaf. The author considers that only the Cuba mosaic type B reported by Acuña and De Zayas [loc. cit.] seems to be identical with the mosaic under consideration.

The papaw mosaic was also successfully transmitted by means of the green citrus aphid (*Aphis spiraecola*). Fifteen out of 33 plants were infected by *A. spiraecola* fed on diseased papaw leaves for varying periods from eight minutes to one hour. Both nymphs and adult insects transmitted the disease. All controls remained healthy. The evidence seems to indicate that the aphids are non-viruliferous while on citrus leaves and that they must acquire the virus during their migration.

The virus is inactivated by a 10-minute exposure at 60° C. and in 48 hours at room temperature. No infection was obtained at dilutions greater than 1 : 1,000. The virus passed with difficulty through a Seitz filter No. 5114–C 10. Leaves air-dried for 48 hours lost their infectivity. *A. spiraecola* retained the virus for three hours, but failed to infect plants after that time.

Balakrishnan (M. S.). **Phytophthora palmivora Butler on Cyphomandra betacea Lendt. and Carica papaya Linn.**—*Curr. Sci.*, xvi, 5, pp. 146–147, 1947.

Two isolates of *Phytophthora*, one from the stem of tree tomato (*Cyphomandra betacea*) with patch canker at the Fruit Station at Burliar, the other from a rotten hollow stem of papaw in Coimbatore, did not produce any oospores in pure culture even after three months. When grown in paired cultures with known plus and minus strains of *P. palmivora* from the culture collection at Coimbatore, the *C. betacea* isolate formed no oospores with two *Areca* strains, one *Colocasia*, and one tomato strain, whereas they were formed in four days when the papaw strain was used [cf. *R.A.M.*, viii, p. 527; xi, p. 205]. The tree tomato strain formed them within four days, however, when grown with the papaw strain or with other strains from *H[ibiscus] esculentus*, *Spondias*, and *Areca* with which the papaw strain formed

no oospores. The latter is considered to be a minus strain and the *C. betacea* isolate a plus strain of *P. palmivora*.

WAIN (R. L.) & WILKINSON (E. H.). **Studies upon the copper fungicides. VII. The solution of copper from dressings on Pea seed. VIII. The penetration of copper into germinating Peas. IX. Investigations with the exudate from fungus spores.** —*Ann. appl. Biol.*, xxxii, 3, pp. 240–243, 243–247, 1945; xxxiii, 4, pp. 401–405, 1946.

In further studies on the copper fungicides [cf. *R.A.M.*, xxiii, p. 138] it was found that pea seeds of the varieties Foremost, Surprise, and Eclipse, while swelling in water, exuded substances which were capable of dissolving insoluble copper seed dressings whether on the seed or used separately. Copper, in dried 4–4–50 Bordeaux mixture, readily passed into solution in water in which peas had been soaked, indicating that soluble complex forms of copper had been formed. It is suggested, on the basis of chemical analyses, that both the fungicidal and phytocidal actions of copper dressings on pea seeds depend mainly on the action of the exudates, notably colloidal protein-like material and amino derivatives, in bringing copper into solution.

In the second paper it is stated that pea seed of the same three varieties showed less injury when treated with solutions of simple cupric salts than when treated with solutions of equivalent strength containing complex forms of copper. When supplementary pea exudate was added to peas germinating in copper sulphate solution greater damage was caused than without the addition. Nevertheless, in spite of the greater phytotoxicity of the complex forms of copper, the copper intake by the seeds was less. Colorimetric tissue tests and chemical analyses of treated peas showed a high concentration of copper in the testa and radicle and only small amounts in the cotyledons. The part fixed on the testa provides fungicidal protection. The main cause of injury in treated seeds is considered to be due to the effect on the radicle of the phytocidal, soluble, complex forms of copper produced by the exudate.

In the third study the amounts of copper dissolved from pure copper compounds by water, by a standardized solution of the exudate of *Neurospora sitophila* spores, by standard solutions of malic and succinic acids and their sodium salts, and by glycine and mannitol, were determined. Compared with the known fungicidal activities of the copper compounds [ibid., xxii, p. 148], the results demonstrated that the amounts of copper yielded to water and to the standardized spore extract or glycine solution provide an indication of fungicidal properties. While soluble copper in excess of that dissolved by water can only appear from alkaline Bordeaux deposit by complex ion formation, it was ascertained that this is not the only means by which copper can dissolve from other copper compounds.

Mannitol, succinate, and fumarate isolated from the spore exudate were unable to dissolve appreciable amounts of copper from alkaline Bordeaux deposit. Malate was not detached in the exudate of *N. sitophila* spores grown on malt agar. The quantity of mannitol in the spore exudate depended on the medium on which the fungus was grown.

KNORR (L. C.). **Common names vs. initials for the designation of new fungicides.**— *Plant Dis. Reptr*, xxxi, 5, pp. 211–212, 1947. [Mimeographed.]

The author deplores the increased use of initial letters for the designation of new chemicals and views with alarm the confusion which will result if the practice is continued. At a recent conference it was proposed to use for new insecticides standard short common names which would be defined and registered with the United States Patent Office to pre-empt its use as a trademark name.

Plant pathologists have not used initialling to as great an extent as entomologists and it is hoped that when common names are given to new chemicals, easily remembered names will be chosen rather than confusing jumbles of letters and figures, which are intelligible only to a chemist.

MAUBLANC (A). **Les champignons de France. Troisième Édition.** [The fungi of France. Third Edition.]—cclxxvii+283 pp., 240 pl. (224 col.), 57 figs., Paris, Paul Lechevallier, 1946. Two vols., 850 fr.

These two small volumes, while intended primarily for amateurs, aim at being something more than merely popular handbooks. In addition to the original coloured plates they contain 32 new ones (16 in each volume) by M. Porchet. The first volume contains a general introduction to mycology (general characters of the fungi, geographical distribution, influence of climatic factors on fungal vegetation, influence of the soil, natural sites of fungi, and seasons at which they appear), and deals with the classification. The anatomical characters and the criteria used in the classification of the Basidiomycetes are described and figured, followed by a detailed treatment of the Agaricaceae. The second volume deals with the remaining families of Basidiomycetes and the larger Ascomycetes, and the toxicology of the poisonous species. The plates illustrate selected species in different stages of development, the spores being shown at a magnification of ×500 and the cystidia at ×250. There is an index to the French names of the fungi, another to the German, English, Italian, and Spanish, and a third to the Latin names. Keys are provided for the determination of the genera, and opposite each coloured plate under the Latin name there is a description of the fungus.

WILSON (E. E.). **The vertical dispersion of spores in the air near the ground by winds of low velocity.**—Abs. in *Phytopathology*, xxxvii, 5, p. 365, 1947.

During overcast periods when thermal turbulence was weak or absent [? in California], the relatively large (33 μ) spores of *Lycopodium* were borne upwards when released 3 ft. from the ground into air moving between 0·6 and 5·4 miles per hour [cf. *R.A.M.*, xxv, p. 404]. Vertical dispersion per unit of downwind distance appeared to reach a maximum at the lowest wind velocity, diminishing rapidly as the latter increased. A similar trend was observed on sunny days when a degree of thermal tubulence was probably present. Ratios pertaining to dispersion downwards from the 3-ft. level likewise declined with an increase in air movement. On an overcast morning with wind velocity of 1½ miles per hour, spores were carried to earth from a height of 3 ft. within a distance of about 12 ft., at which point the number intercepted by the ground increased to about 20 ft. and then decreased.

JOHNSON (E. M.). **Injury to plants by minute amounts of 2, 4-dichlorophenoxyacetic acid.**—*Pythopathology*, xxxvii, 5, pp. 367–369, 1947.

At the Kentucky Agricultural Experiment Station, cabbage, tomato, tobacco, and a number of ornamental plants developed pathological symptoms of various kinds which were found to be due to the use of herbicides containing salts or esters of 2, 4-dichlorophenoxyacetic acid. The injuries occurred in at least four ways, viz., from toxic residues left in spray- or dust-mixing apparatus; vapours from equipment and containers; absorption by roots; and drift of spray or vapours by air currents. The toxic residues of both the ethyl and butyl esters were shown experimentally to remain in metal sprayers after successive washings in hot water and soap, and in strong alkali, but two applications of acetone apparently removed most of the noxious substances. Three washings with tap water sufficed to eliminate the residues of both the ammonium and sodium salts from the appliances.

Hansen (H. N.) & Snyder (W. C.). **Gaseous sterilization of biological materials for use as culture media.**—*Phytopathology*, xxxvii, 5, pp. 369–371, 1947.

The experiments of Whelton *et al.* on the control of microbiological food spoilage by epoxide fumigation [*R.A.M.*, xxv, p. 509] suggested the application of these chemicals to the sterilization of natural substrata for fungus cultures. The following method was adopted. The material is placed in a fruit jar or other container, slightly moistened if necessary, and propylene oxide is introduced at the rate of 1 c.c. per l. capacity of the vessel, which is made air-tight, shaken, and left overnight or longer at room temperature; the fumigant is then allowed to escape and the material is ready for use, either alone or in combination with liquid or solid media. Plant materials, e.g., lucerne hay, pea pods, dry bean straw, wheat seed, youngberry fruit, fresh carrot, dehydrated fruits and vegetables, and the like, insects, or soil mixtures, treated in this manner may be kept indefinitely in the closed containers without loss from microbiological spoilage. Ethylene oxide, though possibly a rather more efficient fumigant than propylene oxide, is explosive in mixtures with air and therefore less suitable for laboratory use. Propylene oxide is inflammable but easily handled, and a small quantity may be kept in a refrigerator at 7° C. ready for use at any time.

Hesseltine (C. W.). **Viability of some mold cultures.**—*Mycologia*, xxxix, 1, pp. 126–128, 1947.

Of 492 mould cultures on potato dextrose agar stored for two years eight months at approximately 7° C., 409 although apparently completely dried were found to be viable and 83 non-viable. In the *Aspergillus niger* group only two of 14 cultures revived, in the *A. wentii* group one out of six, and in the *A. flavus-oryzae* group one out of five. On the other hand, four cultures of *A. fumigatus* all lived, as did all eight of *A. fischeri* and all five of *A. versicolor*.

In a second set of cultures similarly stored for 19 months the results were comparable in that the same highest percentages of non-viable cultures were among the *Aspergillus* spp., while a very low number of non-viable cultures occurred among *Penicillium* spp. and Zygomycetes. It seems important with Zygomycetes to make sure before storage that sporulation has been vigorous and that the spores are fully mature. Cultures contaminated with *Penicillium* or *Aspergillus* were often found to be dead.

Wahl (I.). **On a method of fixing and measuring relative humidity in small closed containers.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 230–237, 1 fig., 1946. [Hebrew summary.]

The method for the determination of relative humidity in closed containers used at the Rehovoth Agricultural Experiment Station is a simplification of that described by Hopp [*R.A.M.*, xvi, p. 112]. It involves the use of super-saturated solutions of various salts in the presence of an excess of the latter, and the growth of the test fungus (without agar) on the inside of the upper cover of the Petri dish. The device used for the measurement of relative humidity is a modified psychrometer, the wet and dry thermometers being replaced by a thermocouple. A moist cloth is wrapped round the thermocouple rod and the temperature of the constant temperature medium is measured by the needle terminal. The accuracy of the measuring device was verified by experiments with super-saturated solutions inducing known percentages of relative humidity. The values thus obtained were reliable within the range of 60 to 90 per cent., beyond which some deviations tended to occur.

Vincent (J. M.). **Distortion of fungal hyphae in the presence of certain inhibitors.**—*Nature, Lond.*, clix, 4051, p. 850, 1947.

The description and figures of hyphal tips growing in the presence of the 'curling

factor' isolated by Brian *et al.* from cultures of *Penicillium janczewskii* [*R.A.M.*, xxvi, p. 117] are stated to be strongly reminiscent of the distortion produced in the hyphae of *Aspergillus niger*, *P. roqueforti*, and *Byssochlamys fulva* [ibid., xxi, p. 206] developing in contact with methyl p-hydroxybenzoate on Czapek's agar at pH4 to 5. Whereas the 'curling factor' induces severe stunting at 6×10^{-6} molar, the concentration of methyl p-hydroxybenzoate requisite for the development of a comparable effect in *A. niger* is of the order of 300×10^{-6} and for complete fungistasis $3{,}000 \times 10^{-6}$.

Sanchez (G.), Boyer (F.), Grumbach (F.), & Lamensans (A.). **Production de pénicilline par culture d'un Penicillium chrysogenum, sur des milieux à base de lacto-sérum.** [Production of penicillin by culture of a *Penicillium chrysogenum* on media with a lacto-serum base.]—*Ann. Inst. Pasteur*, lxxiii, 6, pp. 612–616, 3 graphs, 1947.

High yields of an active penicillin have been obtained by the culture of a strain of *Penicillium chrysogenum* (352–17) on media with a base of lacto-serum, a little-used and inexpensive by-product of cheese manufacture.

Seigneurin (R.) & Roux (A.). **Substances antibiotiques élaborées par certains champignons supérieurs.** [Antibiotic substances synthesized by certain higher fungi.]—*Ann. Inst. Pasteur*, lxxiii, 6, pp. 595–597, 1947.

Besides verifying the remarkable bacteriostatic activity of clitocybin, the antibiotic substance secreted by *Clitocybe candida*, already reported by Hollande [*R.A.M.*, xxv, p. 309], the writers have discovered the existence of a similar property in *Tricholoma georgii*. The zones of inhibition formed round cultures of *Staphylococcus aureus* and Eberth's bacillus [*Eberthella typhosa*] after 48 hours at 37° C. measured 15 to 19 mm. in diameter, respectively, for *C. candida*, and 13 and 9, respectively, for *T. georgii*, compared with 40 and 27, respectively, for a solution of 12,500 Oxford units of penicillin per c.c.

Melin (E.), Wikén (T.), & Öblom (Karin). **Antibiotic agents in the substrates from cultures of the genus Marasmius.**—*Nature, Lond.*, clix, 4051, pp. 840–841, 1947.

In the course of investigations now proceeding at the University of Uppsala, Sweden, on the production of antibiotic substances by Hymenomycetes [*R.A.M.*, xxvi, p. 350], it was found that the metabolic products of *Marasmius graminum* and *M. ramealis* [ibid., xxiv, p. 472] on a number of synthetic media exerted a marked inhibitory effect on the growth of *Staphylococcus aureus*. *M. foetidus* and *M. scorodonius* were also highly antagonistic to the test organism, whereas three other species were virtually inactive.

Dominik (T.) & Jagodziński (S.). **Badania nad mykorhiza niektórych drzew owocowych w ogrodach Kórnickich.** [Researches on the mycorrhiza of some fruit trees in the Kórnik Gardens.]—*Pam. Zabl. Bad. Drzew Lasu Kórniku* [*Mem. Trees For. Res. Inst., Kórnik*], i, pp. 48–73, 10 figs., 1946. [English summary. Received July, 1947.]

The roots of the following species, growing in the Kórnik Gardens and Arboretum, Poland, were sectioned, stained, and examined microscopically: apricot, damson, cherry, almond, plum, quince, apple, walnut, black currant, gooseberry, *Pyrus calleryana*, *P. phaeocarpa*, *P. salicifolia*, *Malus rivularis* [*M. fusca*], *M. purpurea*, *Prunus serotina*, *Sorbus latifolia*, and lime (*Tilia platyphyllos*). All had endotrophic mycorrhiza except *P. serotina* and lime which had ectotrophic mycorrhiza. Damson had ecto-, endo-, and pseudomycorrhiza. The only mycorrhizal organism identified was a species of *Actinomyces* in quince.

The soil of the Kórnik Gardens is sandy, and contains less than 1 per cent. humus and only 0·03 to 0·07 per cent. total nitrogen; the pH of the surface layers is 5 to 6·5. As the minimum nitrogen content for agricultural purposes is 0·02 per cent. the greater part of the nitrogen assimilation must be performed by the fungi in the mycorrhiza. By digesting the mycorrhizal fungi the plant obtains the necessary nitrogen. In manuring tests in orchards it should be remembered that mycorrhiza grow well in acid soils and that organic or ammonia nitrogen is more advantageous to them than nitrate nitrogen. It is considered that the disturbances of symbiotic relations caused by the disappearance of the mycorrhizal fungi or the injury to them arising from improper manuring may be one of the factors causing 'fatigue of the soil'. It is important to identify the species of fungi entering into combination with fruit trees in their natural habitats and to find the soil pH which offers the best conditions for producing and developing mycorrhiza. Only then can manuring tests, supplying combinations which are most easily assimilated by fungi, be undertaken.

Hoyman (W. G.), Munro (J. A.), & Post (R. L.). **Potato fungicide experiments in 1946.**—*Bull. N. Dak. agric. Exp. Sta.*, ix, 3, pp. 85–87, 1947.

The spraying experiments described in this bulletin were designed to determine the effectiveness of some of the newer fungicides in preventing potato early blight (*Alternaria solani*) and late blight (*Phytophthora infestans*). Neither disease appeared, but the results showed that no significant difference existed between potato yields grown on plots which received both a fungicide and DDT and those receiving DDT only. The highest yields were obtained on plots sprayed with zinc-containing fungicides. Six applications of Bordeaux mixture had no apparent effect in reducing the yield.

Main (A. D. C.) & Grainger (J.). **Potato haulm burning with sodium chlorate.**—*Scot. J. Agric.*, xxvii, 1, pp. 14–17, 1947.

Since 1937 sodium chlorate has been employed successfully in Scotland for killing potato haulms [*R.A.M.*, xxv, p. 574] in the control of blight (*Phytophthora infestans*). For spraying one acre of potatoes 12 lb. in 100 gals. water is sufficient, and used at this strength has no deleterious effect upon succeeding crops. Both 1·2 per cent. sodium chlorate and 10 per cent. sulphuric acid applied at the same rate of 100 gals. per acre killed 99 per cent. of the leaves in experiments carried out in 1945 at Auchincruive. Sulphuric acid killed 90 per cent. of the stems and sodium chlorate 80 per cent. Stems killed by the latter tended to remain erect, an advantage where the crop has to be lifted by an elevator digger. Tubers can be lifted 14 days after complete killing, which takes about six days. Sodium chlorate can be applied in a slight drizzle if the amount used per acre is increased by 2 lb., but not in actual rain, whereas sulphuric acid is effective even when applied in moderate rain.

Sodium chlorate is also useful for controlling tuber size in 'seed' crops. As a haulm-destructive spray it should be applied when the number of tubers of seed size is at its maximum. A crop of Arran Pilot treated with a combined copper-containing spray and sodium chlorate yielded 8 tons of seed per acre, with only 2 tons of ware and 10 cwt. of thirds. The tubers had an over-all blight content of less than 0·1 per cent. while unsprayed crops in the neighbourhood had as much as 30 per cent.

The costs per acre are: 12 lb. sodium chlorate 6*s.*; and sulphuric acid, minimum amount 1 carboy, 9*s.*; compared with 10 gals. T.A.C.36c [ibid., xxiv, p. 429] £2.

Details are given of the most convenient and efficient spraying apparatus, by means of which two men can spray 200 acres in 56 hours. Sodium chlorate, though non-corrosive, is inflammable. Workers should avoid getting the solution on their clothes, which would be liable to catch fire when dried.

CHORIN (MATILDA). **The powdery mildews of Potatoes in Palestine.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 259–261, 2 figs., 1946. [Hebrew summary.]

Reference has already been made to the powdery mildew of potatoes caused by a species of *Oidium* in Palestine [*R.A.M.*, xxiv, p. 203], where the disease is now widespread and at times destructive. Another type of powdery mildew, occurring either jointly with the *Oidium* or independently, is due to a species of *Oidiopsis* first observed in 1941 and so far confined to the eastern Valley of Esdraelon and the north end of the Dead Sea. The fungus forms a greyish covering over the veins on the lower surfaces of the leaves. The veins, and sometimes the interveinal tissue, turn brown in isolated, later coalescent, spots. On the upper surface appears a yellow lesion corresponding with the greyish areas on the lower surface. The spots ultimately shrivel. The main difference between the symptoms of the two powdery mildews consists in the preliminary browning of the leaf stalks and veins by the *Oidium*, followed by a whitish, coherent covering of both leaf surfaces in contrast to the discrete spots and greyish coating of the under surface associated with *Oidiopsis*.

LITTAUER (F.), PALTI (J.), & MOELLER (S.). **Potato blight control in Palestine.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 186–201, 3 figs., 1946. [Hebrew summary.]

The occurrence of potato blight (*Phytophthora infestans*) in Palestine [*R.A.M.*, xvi, p. 629] is sporadic, the disease being entirely absent in some years and destructive in others. Severe tuber infection has hitherto been confined to autumn-sown stands and may or may not be preceded by a visible attack on the haulms. During the winter and early spring the disease may be found all along the coastal plain, in the Esdraelon and Jordan Valleys, and in Upper and Lower Galilee, whereas late spring and early summer outbreaks are usually restricted to parts of the coastal plain, particularly northern Sharon between Tel Aviv and Hadera, where morning mists are common. The presence of the pathogen on tubers of local origin was first established in 1942–3. Of the varieties principally grown in the country, Up-to-Date and Epicure are highly susceptible, while Arran Banner, Kerr's Pink, and Doon Star are more resistant.

The disease was effectively controlled in two trials in 1943 by spraying with 1 per cent. Bordeaux mixture or ⅓ per cent. perenox, and in one test with 2 per cent. floridan [ibid., xxiv, p. 198], a proprietary preparation containing about 8 per cent. copper in ammoniacal solution, with an alkaline reaction. Adequate control increased yields and improved the grade of the crop, thereby raising its market value by 25 to 30 per cent. in one experiment.

Early blight (*Alternaria solani*) is very widespread on potato foliage throughout Palestine [loc. cit.], but usually develops late in the growing season. Tuber infection has so far been uncommon. In five experiments from 1941 to 1943, Bordeaux mixture, perenox, and floridan at the above-mentioned concentrations were of about equal efficacy in the reduction of infection. Heavy overhead irrigations with floridan (at two to three times the normal dosage) arrested the spread of the disease. Spraying did not increase the yield in this series of tests and would appear to be profitable only where the crop is attacked at an earlier stage of growth. Slight yield decreases on sprayed plots in which neither early nor late blight developed indicated a limited phytotoxic action.